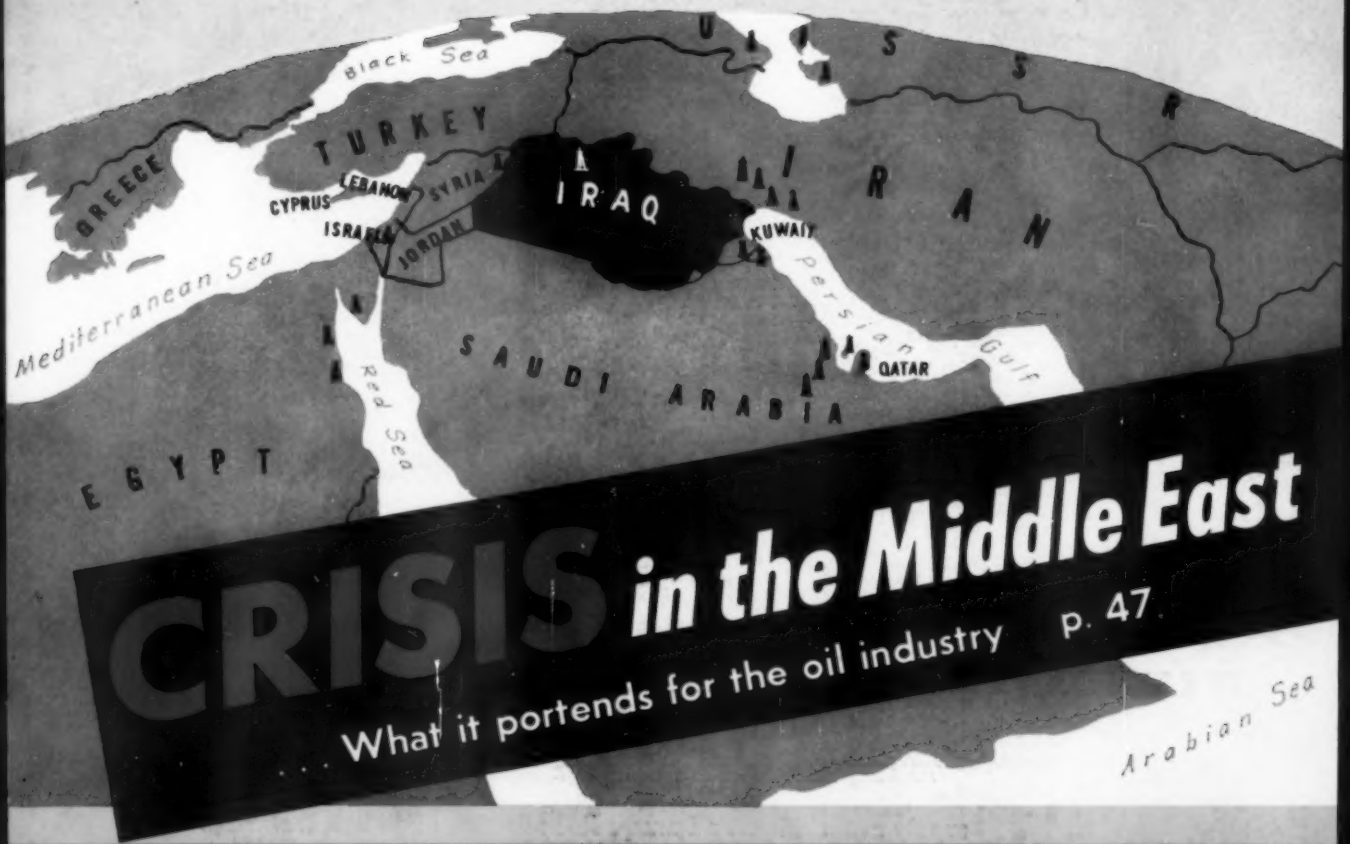
the OIL AND GAS JOURNAL

JULY 21, 1958

EXPLORATION HIGHLIGHTS P. 129



CRISIS in the Middle East

What it portends for the oil industry p. 47

Oklahoma—Wildcatters' Hottest State p. 58

Canada Pushing U.S. for Octane Supremacy p. 54

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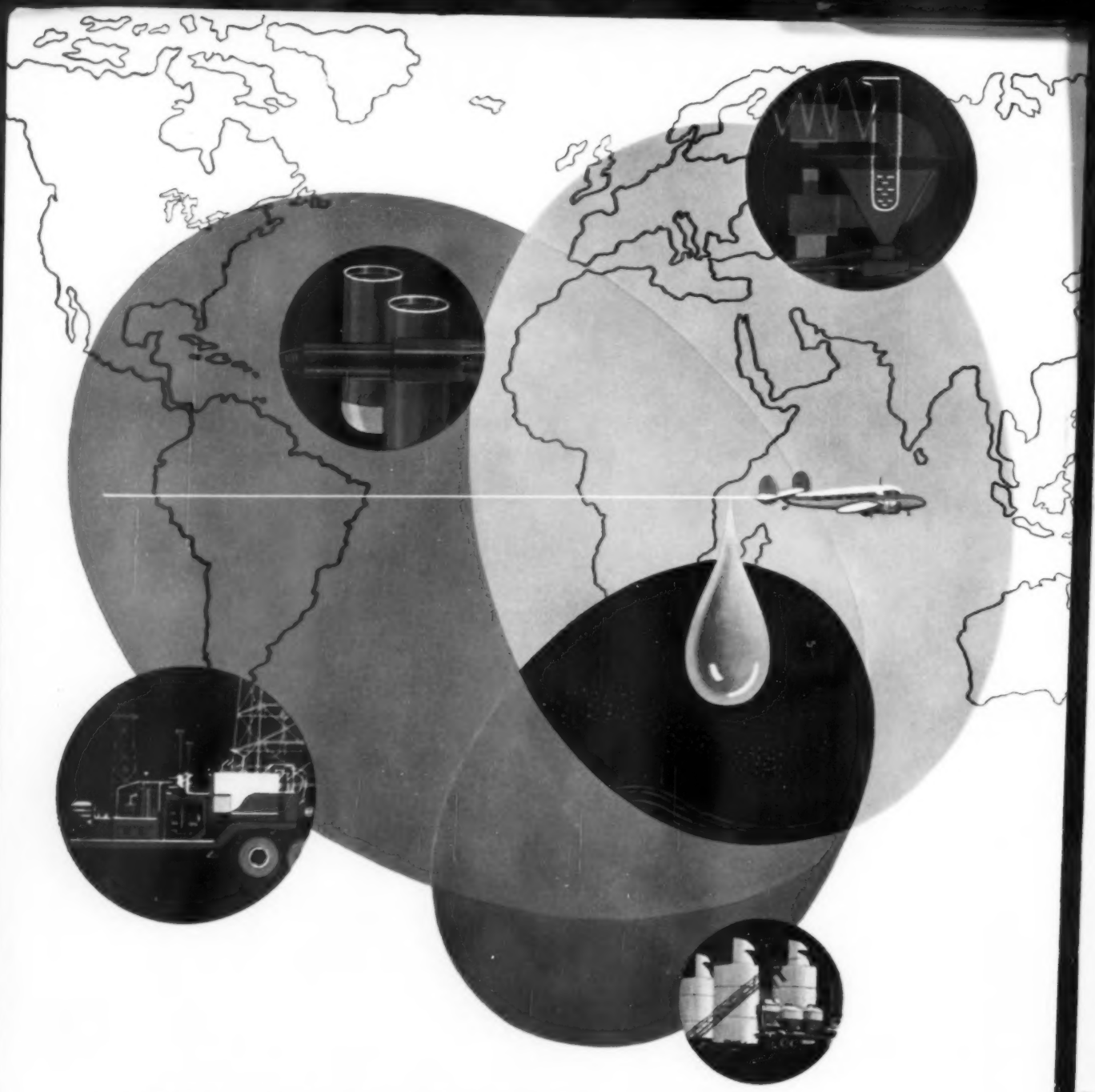

WITHIN THESE SPHERES....

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DUNCAN, OKLAHOMA

the OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
July 21, 1958

Control of oil is the big stakes in the Middle East:

Simple fact of current crisis is this: Whoever has control of Middle East oil has a firm stranglehold on the economic growth of the Eastern Hemisphere.

The economy of Western Europe and much of the Orient depends on this oil. It's now controlled by the West. But with this vital area in the hands of an unfriendly Arab regime or Russia, the West would be in a precarious position.

Industry so far has escaped any injury to its facilities. But it's too early to draw any clear-cut trends from the confusion of the Iraq revolution and American countermoves.

Oil executives are closely watching events for any move to cut the Iraq pipeline, close Suez to oil movement, or nationalize the oil industry in Iraq. They are dusting off alternate supply plans to meet such moves (p. 47).

What is U.S. ability to supply Europe again?

Washington officials say oil lift can be resumed.

Some 365 tanker's, totaling 6 million tons, currently are idle. Most could sail within a week.

Stocks of crude and products are down, but production could be stepped up quickly in an emergency.

Oil men warn, however, Western Hemisphere industry would be strapped to supply Europe indefinitely.

Public attacks on oil industry have only begun. You can expect more accusations that American troops are in the Middle East just to protect rich oil investments.

What oil men should not forget is this: The investments themselves are not important. But what is vital is that this storehouse of oil be kept readily available to the West.

Increasing oil field and pipeline activity is cheering news to steel producers.

They shuddered collectively when the Memphis decision last fall brought a screeching halt to line construction. About a million tons of pipeline orders were wiped off steel company books.

Operators have learned to live with the court ruling. Pipeline work is resuming. Market for large diameter pipe is showing signs of life. Steel mills are counting on stepped-

up demand for oil country goods and line pipe.

Lone Star Steel has noted some increase in demand for casing and tubing in recent weeks. Lone Star, which cut back production because of reduced oil field activity, is now back to normal operations.

Lone Star President E. B. Germany is optimistic about the outlook. He cautiously adds, "provided there is no unexpected deviation from current construction and drilling programs."

And the expected steel price increase--it probably will come some time in August.

Sign of the times:

An annual efficiency contest among Phillips' manufacturing plant employes. The winning plant will be awarded a trophy for its employes' contributions toward plant efficiency and cost reduction.

More proof of value of floating core-drilling barges:

Advance core tests--with results kept secret--played a big role in record bonus bids of $55.5 million offered for five parcels off Santa Barbara coast. (p. 50).

How current recession has affected oil work force is shown in case of Humble, top domestic producing company.

Since February 1, Humble has placed 365 employes on early retirement and laid off 475 others. These together represent 4% of Humble's work force.

All but 352 of the workmen came under Humble's temporary program of special retirement and layoff allowances. Many of the laid-off employes not covered by the benefits were offshore workers with less than a year's service.

Humble has put 10 drilling tenders in mothballs and has shut down all offshore rigs but two (OGJ, June 30, p.44)

The discussed merger between Foster Wheeler Corp. and Fluor Corp. is off. Talks ended by mutual consent. J. S. Fluor, president, said Foster Wheeler was one of several firms with which Fluor was discussing merger possibilities.

Wildcatting notes:

TXL Oil will drill a remote exploratory test in the Delaware basin of West Texas. It's scheduled to 15,000 ft. Drill site is 14 miles southwest of Toyah in Reeves County. There's no nearby production nor dry holes.

Amerada will take a wildcat to 8,000 ft. in southwestern North Dakota. Site is 45 miles southeast of Rocky Ridge field in Hettinger County. Shell has one going east of there.

Pan American has important Mississippian and Pennsyl-

vanian gas production at a wildcat in Northwest New Mexico. Ute Mountain-Tribal-D, near Ute Dome field, was completed for 28,150 M.c.f. of gas per day. Production is from three zones.

A sudden surge of exploratory success is reported in northwestern Montana's Cut Bank region.

Shell Oil recovered oil on test of the Madison at a wildcat in Glacier County.

Carter swabbed 21 bbl. of oil in 1 hour on test of the Cut Bank-Cretaceous at a stepout test northwest of Darling field. It indicates first oil production in the area.

Chalk up another big one for California's Saticoy field.

Shell completed 7 Saticoy. It flowed 1,000 bbl. of oil daily on 21/64-in. choke from perforations at 8,728-8,856 ft. That's better than most of the two dozen wells in the field.

Batting averages for both wildcats and field wells in the Rockies continue to climb.

Success ratio of wildcats for first 6 months of 1958 is 13.2%, compared with 11.8% a year ago; and field wells, 52.5%, up 1.8%.

Comparisons of first 6 months with first-half 1957:

. . . More wells completed, 2,095 compared with 1,918.

. . . More successful wells, 1,100 compared with 972.

. . . Discoveries down to 94 from 102. But last year it took 154 more wildcats to produce only 8 more discoveries.

The Rockies could be heading for the second best drilling year in its history. The best was 1956 with 4,954 wells completed.

Oklahoma has become nation's hottest wildcat state.

Significant discoveries have been made during the year's first half in many sections of the state. Generally, the play has been this: Gas in the northwest and deep Ordovician oil in the central and south.

Wildcat completions have been 443, up 25% over same period last year.

Total completions are 3,217, up 4.6% over last year.

If trend continues, Oklahoma explorers will have a good year. Discoveries also should provide a good backlog of development drilling for several years (p. 58).

The CATC group is going ahead with its proposed sale of offshore gas to TGT. That means the FPC will set the price later (OGJ, July 14, p.79).

Meanwhile, a rehearing is being sought before the Philadelphia court which knocked out a previous FPC order approving the sale. If the rehearing is denied, an appeal will be filed.

The court ruled public interest was not determined when FPC approved the rate base, 22.4 cents per M.c.f. That was the highest gas price ever contracted for on the Gulf Coast.

So, no one knows how the ball is going to bounce—except the gas will be sold.

Natural-gas demand is ignoring the recession.

Future growth is indicated in shipments of gas-fired furnaces, boilers, and conversion burners for residential central heating. These shot up a healthy 14% in May over the same month of 1957.

Common labor on pipeline construction jobs will cost more this year.

Increases negotiated between Laborers' International Union and Pipe Line Contractors average about 4%, with some variation among states.

Here's a switch in U. S. and Canadian gasoline quality:

Canada's regular grade has edged ahead of U. S. in octane value. And the gap between premium has been narrowed.

Canadian regular is now 91.6 RON, compared with 91.2 in the U. S. U. S. premium averages 98.5 RON against Canada's 98.2 (p. 54).

Demand for commercial jet fuel will step up this fall.

Three major airlines, American, United, and Eastern, expect to enter the jet age then. They have contracted for 15 million barrels annually. That's equal to more than 20% of domestic military and commercial demand last year.

Refiners should beware stepping up gasoline yields too fast (p. 150).

Gasoline stocks took a sudden upward turn last week. For the week ending July 4, stocks were 2,513,000 bbl. below same time last year. Then last week they shot 200,000 bbl. above the year ago figure.

Reason for the switch: A 300,000-bbl. daily drop in demand plus a 200,000-bbl. weekly gain in gasoline production. This output was achieved despite a 365,000-bbl. daily cut in actual refinery runs.

Refining trend for the past month has been greater gasoline production in spite of declining crude runs. Real trouble could come if crude runs are stepped up and heavy gasoline yields continue. Then, stocks would pile up again and gasoline-dumping practices return.

Refiners should strive to maintain present price strength. Prices are up but not yet up high enough. For example: Gulf Coast regular gasoline is only 0.1 cent higher than in the summer of 1948.

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the OIL AND GAS JOURNAL

JULY 21, 1958 • VOLUME 56 • NUMBER 29

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TECHNOLOGY–OPERATION

Drilling-Production

Vapor Recovery Turns Evaporation Loss Into a Profit 73

By R. E. Fields

A $40,000 investment paid out in less than 5 months. And a substantial stock-tank evaporation loss in Block 31 field, Crane County, West Texas, has been eliminated. The recovery system is an adjunct to centralized storage facilities recently installed in the field.

Pick the Right Cement for the Right Job . . . 77

By B. E. Morgan

Here is a set of physical and chemical requirements constituted specifically to cover those properties needed in the cementing of oil and gas wells. It fulfills the need for a practical specification. And it also furnishes a method of classifying and identifying portland cements in terms related to their use in well-cementing operations.

Refining-Processing

Longer Life for MEA Reboilers 82

By Larry Resen

The service life of these reboilers at the Lake Charles, La., plant of Olin Mathieson Chemical Corp. has been extended by effective removal of stagnant CO_2 pockets.

Gas Chromatography—Powerful New Tool for Chemical Analysis—3 86

By H. H. Hausdorff and N. Brenner

Six variables must be considered for effective gas chromatography. An ideal eight-component mixture was used to establish the effect of these variables on running speed, obtainable separation, and accuracy of quantitative determination.

Corrosion Problems in Light-Hydrocarbon Liquids Plants 93

By J. S. Connors and C. L. Seyer

Here are some typical problems encountered in handling light hydrocarbons and their solutions. Corrosion in aqueous-amine treaters, corrosion in steam and steam-condensate systems, and cooling-tower piping corrosion are handled on a case-history basis.

On The Job . . . Plants and Fields: Plastic Repair May Solve Leak Problems 97

A 36-ft.-diameter tank completely pitted with pin holes satisfactorily repaired—36-ft. rip in gasoline tank successfully roof patched with glass cloth laminated with plastics—Plastic patches applied to tank exterior walls sealed leaks completely—Naphtha line, tank-exterior seams, centrifugal pump, and sump-pit repairs also made satisfactorily.

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Pipelining

Plastic Coverings Give Floating-Roof Performance in Fixed-Roof Tanks 100

By K. C. Bottenberg

Plastic coverings, either as blankets or small hollow spheres are being used successfully within the petroleum industry to reduce evaporation losses from petroleum liquids stored in fixed-roof atmospheric tanks. A number of installations have been made and the results obtained have been good.

On The Job . . . Pipelining: Nitrogen Keeps Line Corrosion-Free 107

Exploration

Oil Outlook Is Good in Hungary 84

By George De Mohrenschildt

Geologically Hungary remains a good exploration province. Increased drilling should give the country new oil fields and large reserves.

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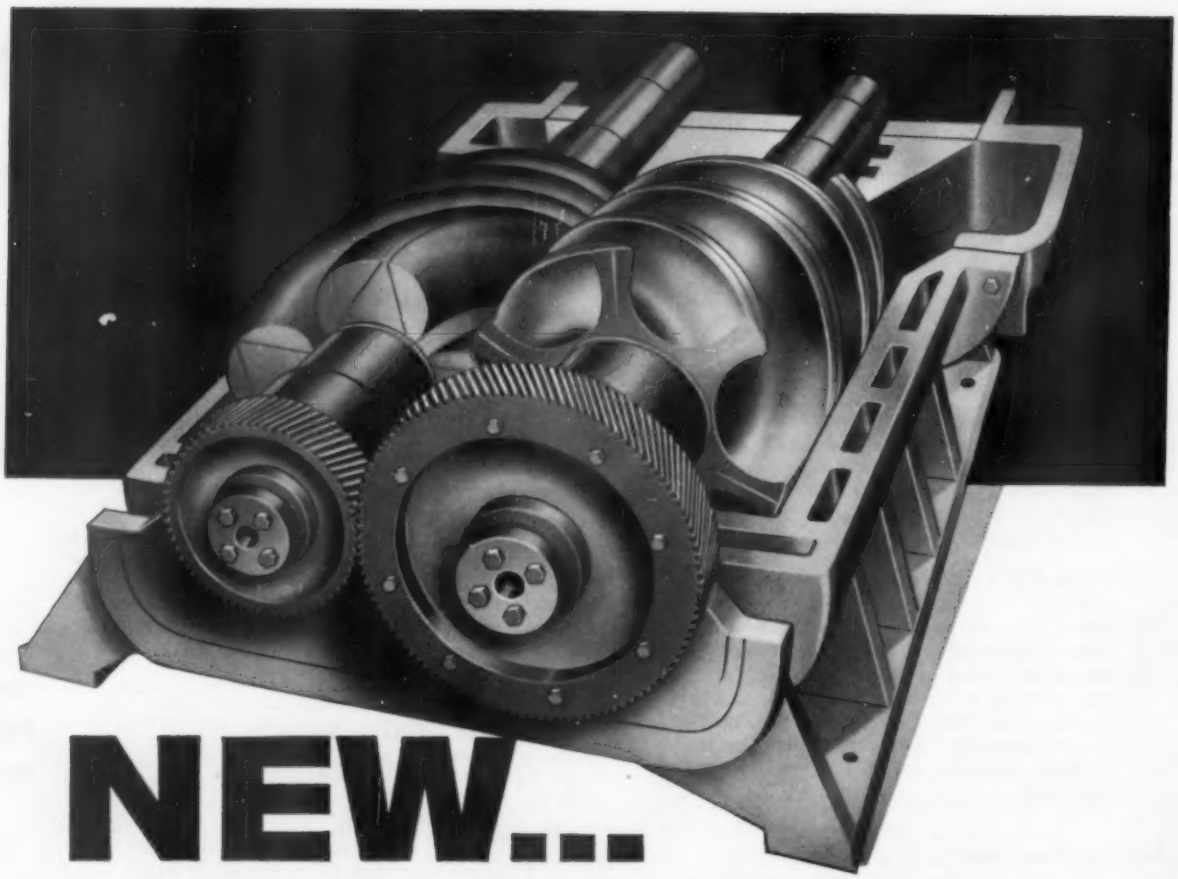

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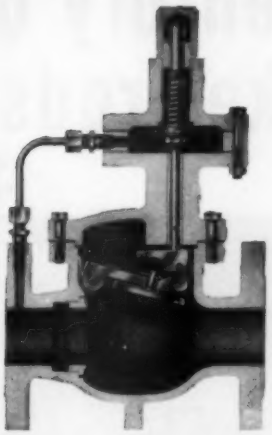
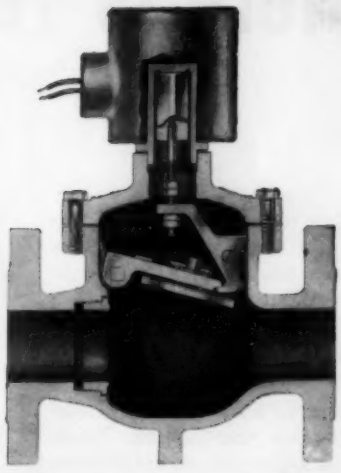


Model 1500H shown, is a high pressure shut-off valve which closes automatically and instantly when predetermined high pressure is reached. With addition of a fusible metal plug, valve can be furnished to shut off on overpressure and/or overtemperature. With control pressure above diaphragm, valve can be made into a low pressure shut-off valve. Combination high and low pressure shut-off also available.



Model 1700 shown, is a Solenoid operated valve normally energized to maintain valve in open position. On interruption of electric current valve closes instantly. Model 1800 Solenoid shut-off valve available to shut off gas instantly by applying electric current either automatically or through a "panic" button.

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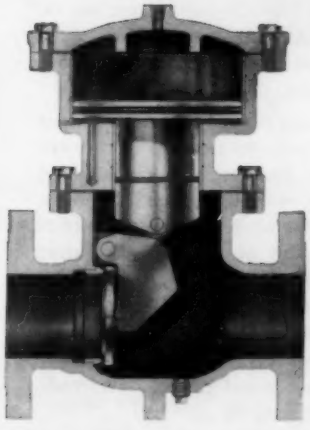

Model 3000 shown, is a piston operated valve, which opens instantly when pressure above the piston is released. Restoring the pressure above the piston closes the valve. The operating pressure above the piston can be obtained from the line or from an independent source of gas or liquid and can be automatically released or applied by instrument air or gas operated pilots or by use of a small three-way Solenoid valve.

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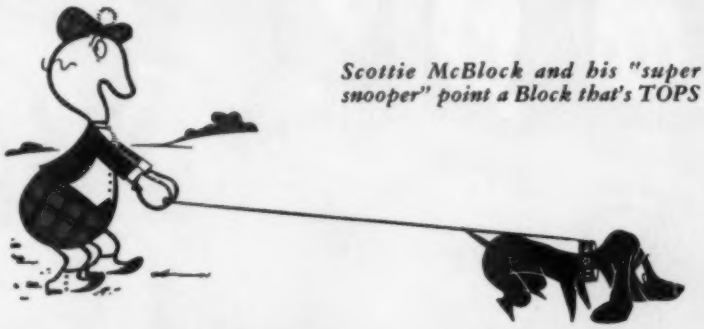

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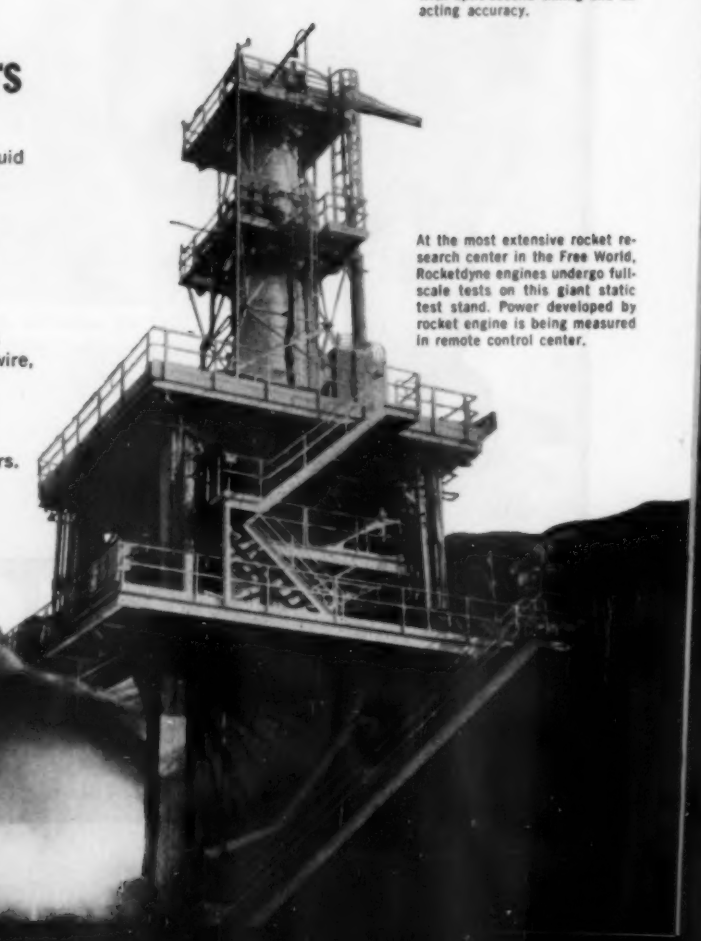

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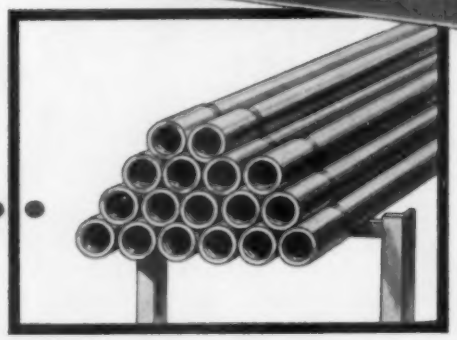
Pumps...

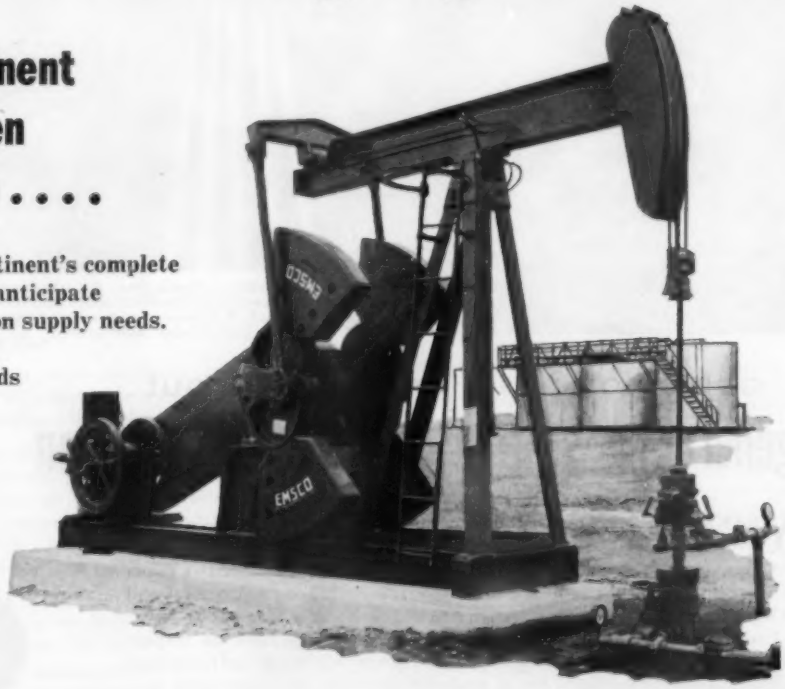
Pipe...



Production Equipment

from Mid-Continent where and when you need them....

You can count on Mid-Continent's complete field stocks . . . planned to anticipate your drilling and production supply needs. Your local Mid-Continent field store carries thousands of items in stock to meet the specific supply and equipment requirements of your area. For complete supply service . . . around the clock . . . call your Mid-Continent representative.

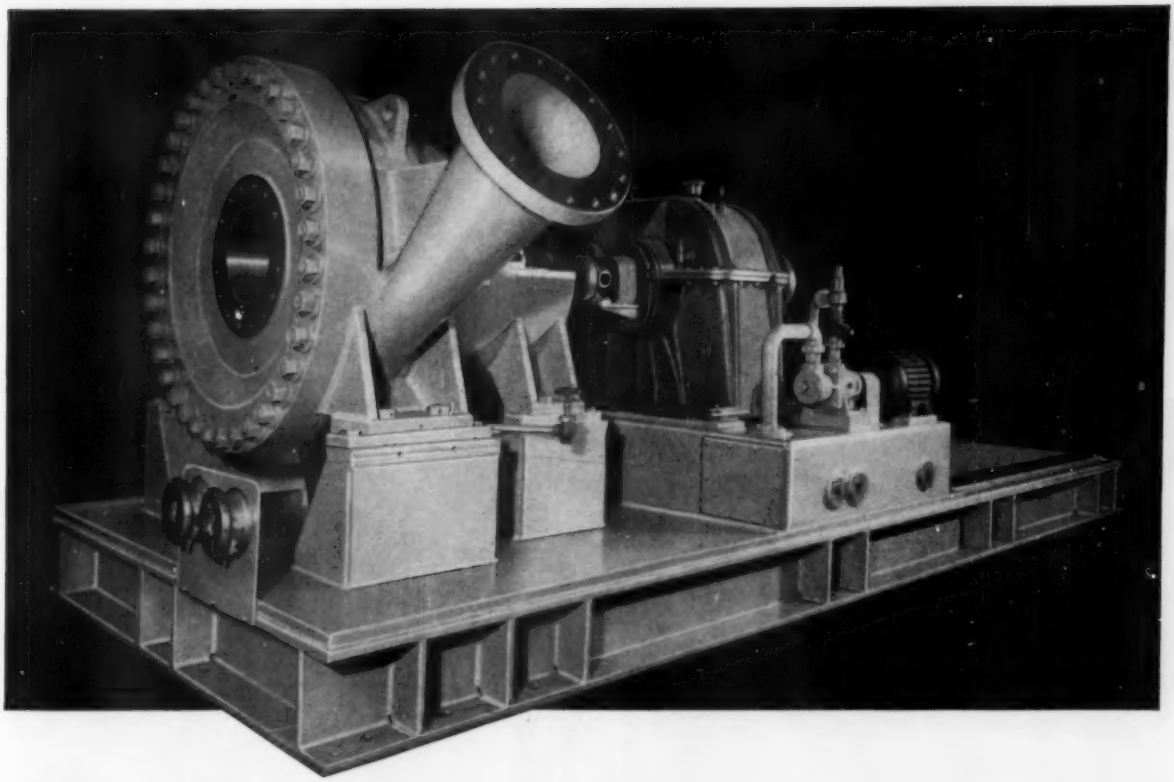


MID-CONTINENT SUPPLY CO.

MID-CONTINENT BUILDING • FORT WORTH, TEXAS

Export Division: 45 Rockefeller Plaza, New York 20, N. Y. Cable: MIDCUMPORT NYK

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY



NEW

Single-Stage Barrel-Type
Allis-Chalmers Compressor

Boosts High Pressure Gas to Higher Pressure Levels in Range of 50 to 500 psia.

THIS new Allis-Chalmers development extends the range of single-stage compressors into high pressure levels previously handled by reciprocating type units.

The new compressor has all the advantages of a centrifugal compressor — compactness, pulsation-free operation, few wearing parts, easy maintenance.

The unit shown above, now in successful operation, boosts 3690 cfm of air from an inlet pressure of 185 psia to a discharge pressure of 240 psia. It is driven through a speed-up gear by an Allis-Chalmers 1250-hp motor.

The casing consists of three principal parts: the casing cylinder, a bolted casing head and a fabricated casing pedestal. A diaphragm which forms the gas diffuser passage is inserted into the casing cylinder. Excellent gas sealing is assured, since there is only one shaft extension and only one casing joint to seal against gas pressure.

For details, including a sectional view of this new compressor, call your nearby A-C representative, or write Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5728

SAVE manpower

SAVE money

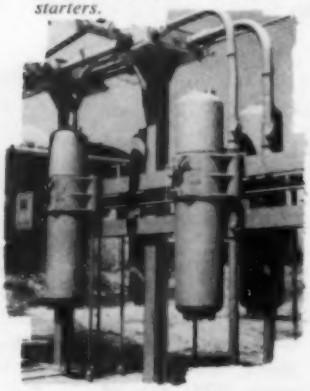
SAVE with Safe, Automatic Power

SAVE maintenance

Automatic convenience of safe electric power assures thrifty service as you need it.

To provide highest continuity of service at lowest possible cost for this refinery, Purchased Electric Power is used providing safe, dependable, automatically operated preferred-alternate 12KV power service. Typical explosion-proof load center for delivery of 480 volt power to processing and cooling pumps are shown at extreme right. Wherever you need safe, automatic power at lowest possible cost, call your nearest Utility Electric Power Company . . . or write us.

Battery of explosion-proof across-the-line starters.



Safe electric load center

Purchased Electric Power . . . saves money, manpower, maintenance and serves you better automatically

Petroleum Electric Power Association

P. O. BOX 35006, DALLAS 35, TEXAS

Fifth year for X2 string

--and it's still going strong

November, 1957, marked five full years of service for a 6625-ft string of Bethlehem X2 Sucker Rods in a well operated by Oil & Gas Property Management, Inc., near Dayton, Texas.

At the time of the photograph, the well—No. 2 in Tract No. 1 of the Sun-Gulf-Humble Fee—had a pump setting of 6652 ft, and was producing a steady 34 bpd from the Yegua Formation. The pumping unit, a Bethlehem 228D-20S, was operating at 14½ 64-in. spm.

The X2 rod is just what you need for economy in medium pumping duty, whether in non-corrosive wells or those which are properly inhibited. The X2 is forged from AISI 1036 carbon-manganese steel, and is slowly and carefully normalized to provide uniform mechanical properties.

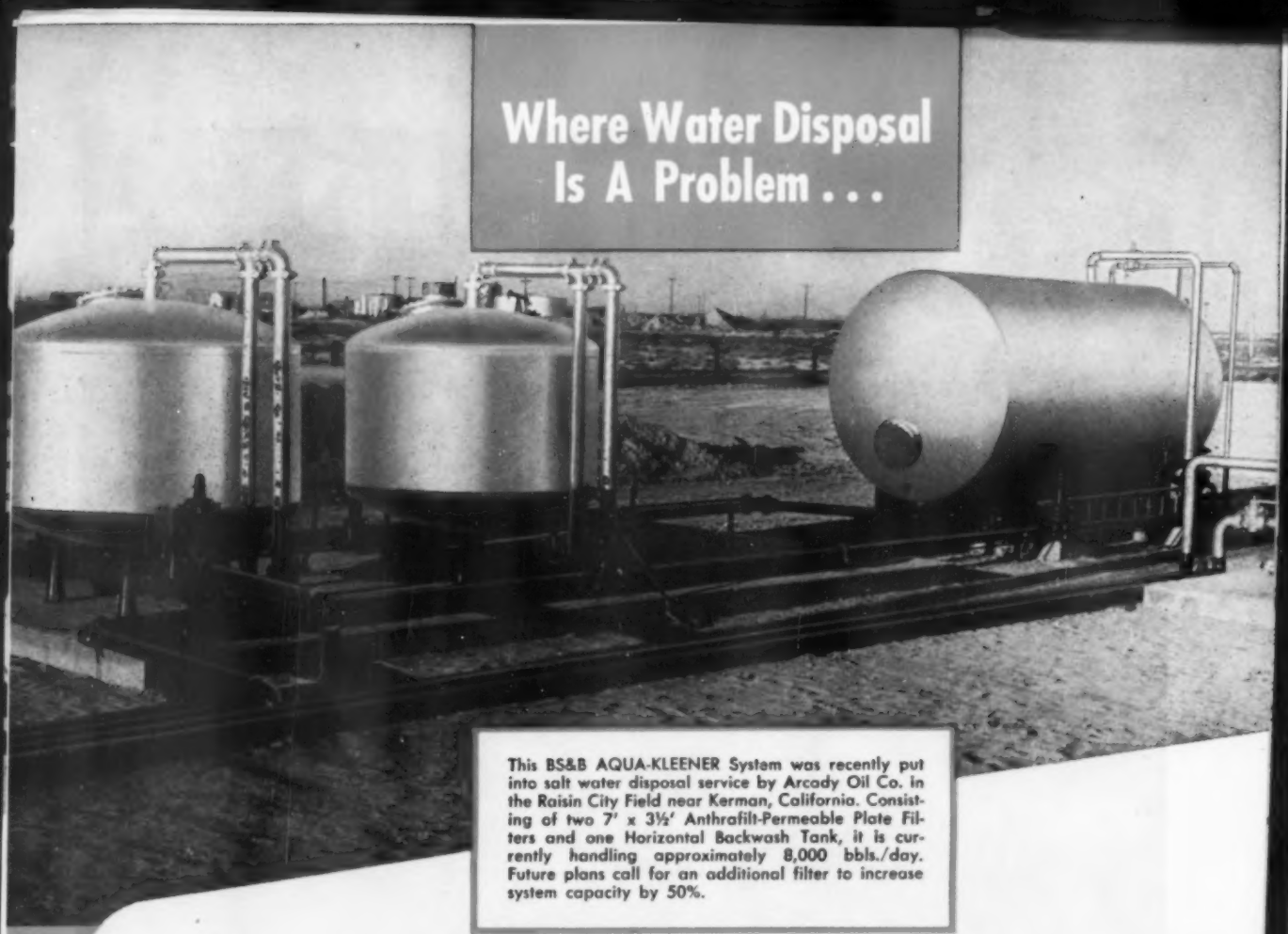
Perhaps you would like to try the X2 in some of your new wells, or as a substitute rod in existing wells. Your Bethlehem sucker rod distributor is at your service. Or drop a line to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



This BS&B AQUA-KLEENER System was recently put into salt water disposal service by Arcady Oil Co. in the Raisin City Field near Kerman, California. Consisting of two 7' x 3½' Anthrafilt-Permeable Plate Filters and one Horizontal Backwash Tank, it is currently handling approximately 8,000 bbls./day. Future plans call for an additional filter to increase system capacity by 50%.

Install a BS&B AQUA-Kleener® System!

Today, more and more oilfield production men are turning to the BS&B AQUA-KLEENER System as a practical and economical solution to the problem of lease-produced water disposal without the contamination of land areas or surface waters, and without clogging of water injection wells.

Through an improved process of settling and filtering, AQUA-KLEENER removes oil traces and solid particles, and prevents air from contacting the water—thereby reducing precipitation due to oxidation of iron, minimizing corrosion, holding carbon dioxide in solution, retarding aerobic bacteria growth, and in most cases, eliminating the need for chemical treatment of the water.

Each of the components of the AQUA-KLEENER System can be utilized separately or in various combinations, as determined by the type of application and degree of water conditioning required.

If you have a water injection or disposal problem, it will pay you to get full details on BS&B AQUA-KLEENER — today's outstanding water conditioning and filtering system! Ask your BS&B Man — or write to . . .

BS&B

BLACK, SIVALLS & BRYSON, INC.

Oilfield Equipment Division, Dept. 1-A7A

P. O. Box 1714

Oklahoma City, Oklahoma

No wonder this driller

STANDARDIZES ON "JIMMY" DIESELS!

"Prompt service and parts when needed—that's what has sold us on GM Diesels through the years," says Lee Killingsworth of Jackson Oil Company, Longview, Texas, who now operate four GM Diesel-powered rigs.

"We have to have an oil-field engine with an appetite for heavy work loads and a high degree of portability," he adds. *"The 'Jimmy' Diesel is our choice on both counts!"* The rig shown here drilled 15 wells between August and December, 1957, with no downtime for repairs—moved on the average of three times a month.

This is typical of the trouble-free performance, with lowest-cost upkeep, you get with GM Diesel power. And because these rugged engines are 2-cycle, they pack more power in smaller space with less weight, which makes them far easier to move. Your nearby GM Diesel distributor will gladly explain why a GM Diesel costs *less* to buy—*less* to run—*less* to maintain. How about calling him today?

DETROIT DIESEL ENGINE DIVISION OF GENERAL MOTORS, DETROIT 28, MICHIGAN

Regional Offices: New York, Atlanta, Detroit Chicago, Dallas, San Francisco

In Canada: GENERAL MOTORS DIESEL LIMITED, London, Ontario

GM GENERAL MOTORS DETROIT DIESEL POWER

Now—more than ever—it pays to standardize on GM Diesel—Parts and Service Everywhere

GM FORWARD FROM SIXTY

GM Twin "4-71" drives Spencer-Harris draw works. Twin "6-71" drives 7¼" x 16" Gardner-Denver mud pump—has been in steady service over two years without downtime.

CYANAMID ANNOUNCES
commercial production of new
AEROCAT® 2000
fluid cracking catalyst

This new catalyst, designed for "problem" operating conditions (such as heavy metals contamination) in catalytic cracking units, is now being produced commercially at Cyanamid's plants in Fort Worth, Texas and Michigan City, Indiana.

AEROCAT® 2000 Fluid Cracking Catalyst provides activity stability with greater economy than other low-cost catalysts. It offers an octane advantage, superior attrition resistance, and lower production of coke. AEROCAT 2000 has controlled bulk density for better fluidization properties.

Extensive testing on principal types of gas oils shows new AEROCAT 2000 to have outstanding catalytic properties. Because it is made under the same conditions of control in the same equipment as our other synthetic catalysts, it also has uniform physical properties. Ask your Cyanamid man for complete data on the new AEROCAT 2000.

Basic in Catalyst Chemistry

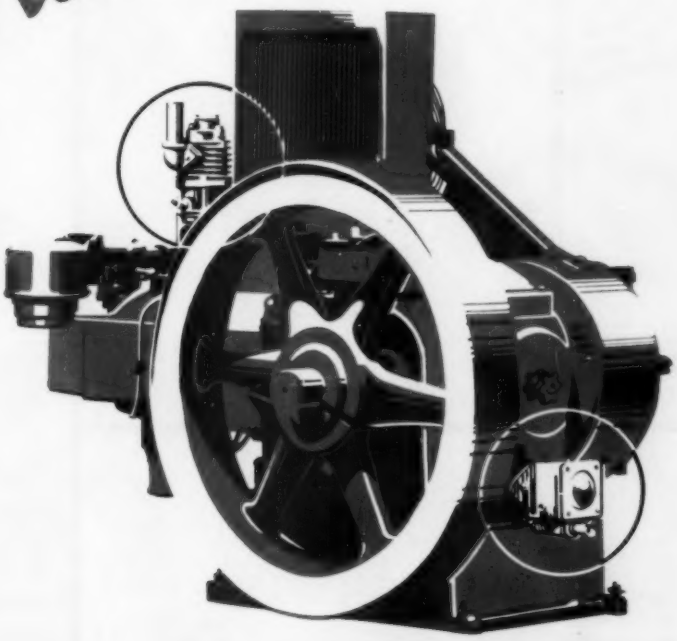
CYANAMID

AMERICAN CYANAMID COMPANY • REFINERY CHEMICALS DEPARTMENT • 30 Rockefeller Plaza, New York 20, New York

Originators of AEROCAT® Fluid Cracking Catalysts, AEROCAT TRIPLE A® High Alumina Catalysts, AEROFORM® Fluid Hydroforming and Platinum Reforming Catalysts, AERO® HDS Catalysts, AERO® Specialty Catalysts, CYPAN® Drilling Mud Conditioner, AEROLUBE® Lubricating Oil Additives, AERONOX® Antioxidants, AEROSOL® Surface Active Agents

LOWER LIFTING COSTS WITH C-E ENGINES

Ren-automated



THE C-E ENGINE LINE—KNOWN FOR LOW MAINTENANCE NOW REQUIRES EVEN LESS WITH

REN-AUTOMATION

Ren Oil Level Regulators automatically maintain the proper crankcase oil level from a separate Ren oil supply system. Ren Exhaust Condensers automatically provide mineral-free water to the engine cooling system by condensing water from the engine exhaust gases.

To the proven low operating and maintenance costs of C-E Engines is added Ren-automation to eliminate daily engine attention—the most costly factor in oil field engine operation.

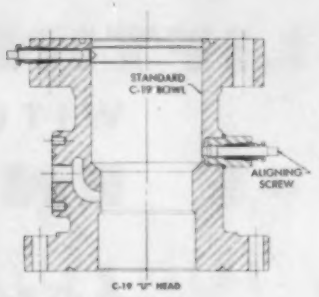
Your Continental-Emsco store can provide you with new Ren-automated C-E Engines and can Ren-automate the C-E Engines you now have.

CONTINENTAL-EMSCO

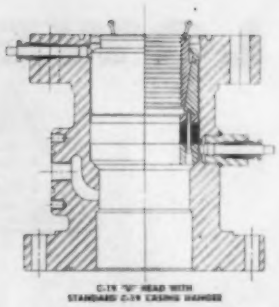
Serving the Oil and Gas Industries ... Worldwide

CONTINENTAL-EMSCO COMPANY • A DIVISION OF THE YOUNGSTOWN SHEET AND TUBE COMPANY • GENERAL OFFICES: DALLAS, TEXAS

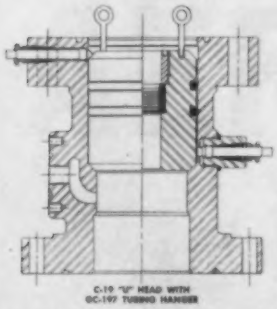
IT'S NEW!
A COMBINATION CASING OR TUBING HEAD FROM O-C-T



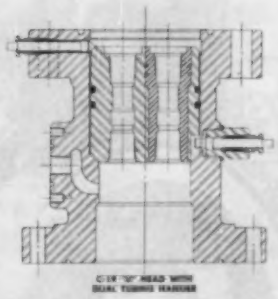
A. This cutaway of the C-19-U Head shows retractable aligning pins 90° from outlets.



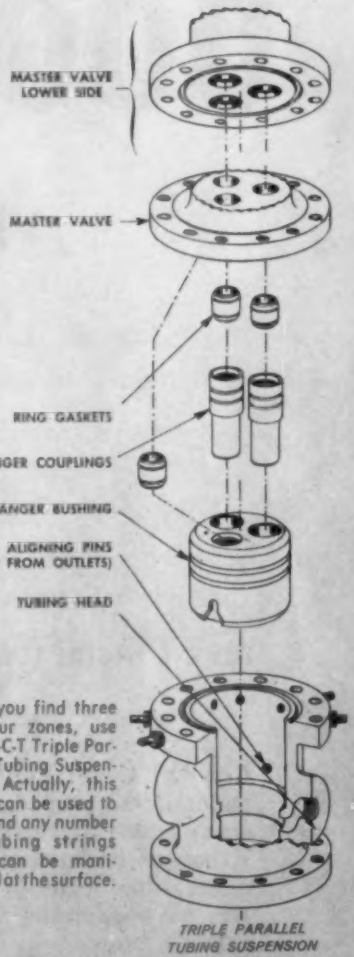
B. If it is necessary to set another casing string, simply use the time-proved C-19 Casing Hanger.



C. If you want to complete only one zone, install an O-C-T GC-197 Tubing Hanger.



D. If two zones are productive, install the O-C-T Dual Tubing Hanger. There is no need to change the head itself.



E. If you find three or four zones, use the O-C-T Triple Parallel Tubing Suspension. Actually, this head can be used to suspend any number of tubing strings that can be manifolded at the surface.

For Single, Double, Triple, Quadruple or Quintuple Completions

Now, for the first time, you can install a head that can serve as *either casing or tubing head*. Even more important, single, dual, triple, quadruple, or even quintuple completions, can be made without changing the head. Just use the appropriate O-C-T hanger and connecting equipment. This is just one example of how modern O-C-T well head equipment protects wells, saves well completion money and increases allowables by simplifying multiple completions. Ask your O-C-T representative about *your* completion problem.

where progress is a daily practice

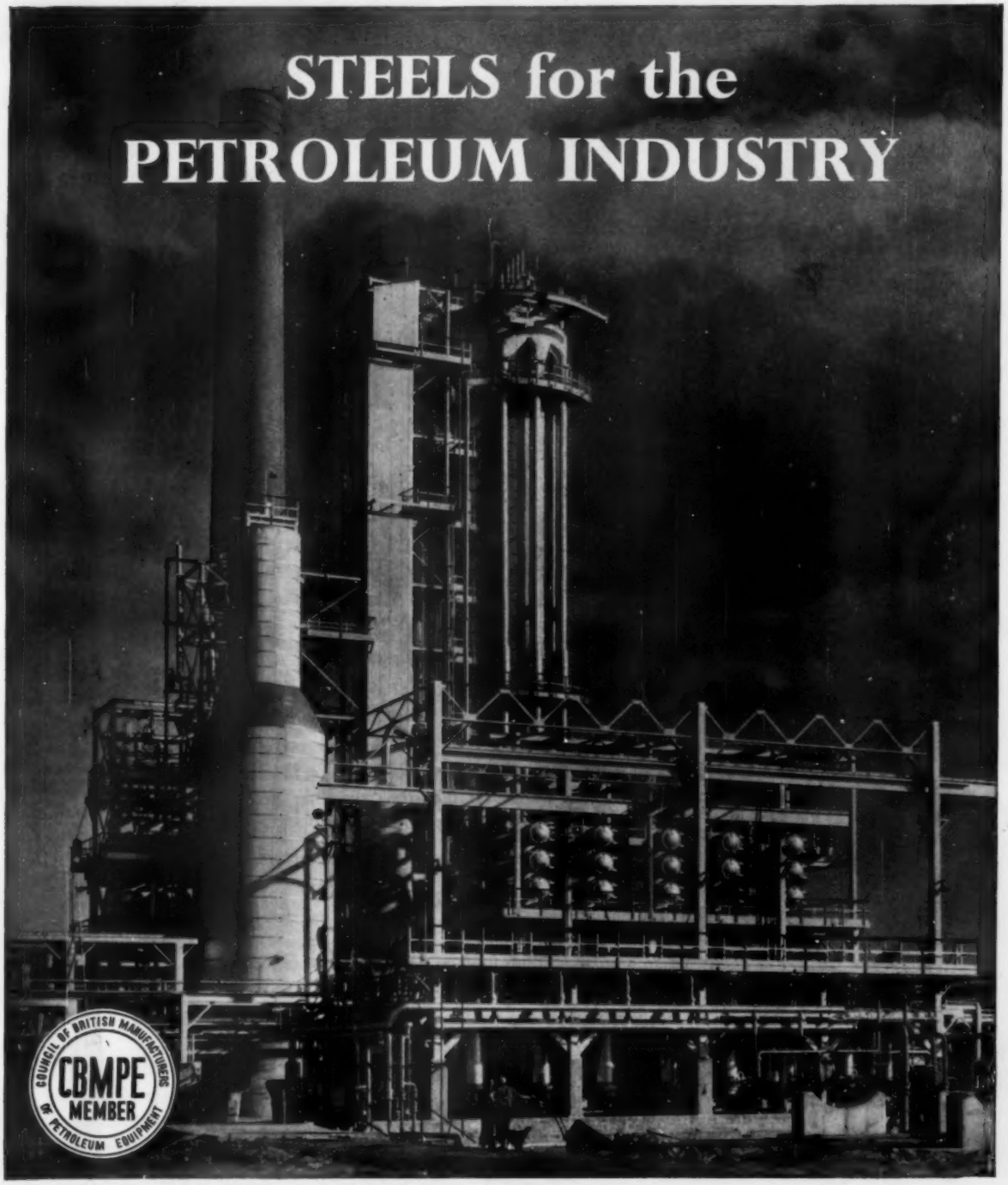
O·C·T

OIL CENTER TOOL CO.

SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Address Export Inquiries for All Countries to P. O. Box 3091, Houston, Texas.

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND



"A Symphony in Steel"—A British Petroleum Company photograph.

THE UNITED STEEL COMPANIES LIMITED, SHEFFIELD, ENGLAND

APPLEBY-FRODINGHAM STEEL COMPANY • SAMUEL FOX & COMPANY LIMITED • UNITED COKE & CHEMICALS COMPANY LIMITED
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DISTINGTON ENGINEERING COMPANY LIMITED • OWEN & DYSON LIMITED • YORKSHIRE ENGINE COMPANY LIMITED

THE UNITED STEEL COMPANIES LTD

PROBLEM: LOST CIRCULATION

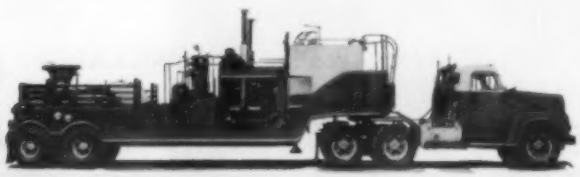
SOLUTION: HALLIBURTON "STOP-LOSS" TECHNIQUES

For solving such costly lost circulation problems as the continuing loss of drilling fluid or cement into crevices, fissures or vugs... Halliburton "stop-loss" techniques restrict these losses to a minimum. The result is more profitable well operation.

Because lost circulation may result from any of a number of causes, no single technique offers a universal solution to all such problems.

To meet the various types of circulation loss problems, Halliburton has devised a number of remedial techniques. By means of blocking, plugging, or squeezing operations, or by lightening the column of drilling fluid or cement slurry, circulation losses may be eliminated or substantially reduced. Many special lost circulation materials aid in increasing the effectiveness of "stop-loss" techniques.

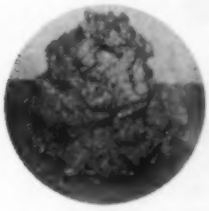
To get the benefits of Halliburton lost circulation service for your well, call your nearby Halliburton representative for his specialized assistance.



HALLIBURTON

OIL WELL CEMENTING COMPANY, DUNCAN, OKLAHOMA

SPECIAL TOOLS AND MATERIALS MAKE HALLIBURTON "STOP-LOSS" TECHNIQUES MORE EFFECTIVE

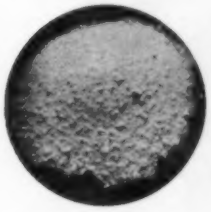


BENTONITE DIESEL OIL (BDO)

...a thin slurry of bentonite in diesel oil, BDO is pumped down the drill pipe to mix with the drilling mud and form a sticky, putty-like material to shut off circulation loss.

TUF-PLUG

...a special blend of graded ground walnut shell used as additive in cement or drilling mud, often provides an effective seal to shut off wide fractures.

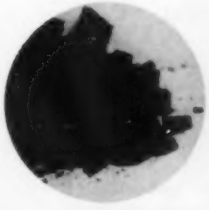


PERLITES

...a lightweight material in granular form, expanded Perlites blended with cement are effective blocking agents and fluid column weight reducers.

PALCO SEAL

...composed of redwood fibers, offers economy and versatility for lost circulation problems with drilling fluids.



BLOX-ALL

...a chemical solution pumped into the well as a liquid, it thickens into a gelled material in the drill pipe, then is extruded into the lost circulation zone where it sets to form a stiff, rubbery mass.

FLOCELE

...An inert cellulose film flake that helps prevent and reduce loss of cement into weak, permeable formations. Economical to use; only ½ to 1% of Flocele, added to cement slurry, effectively seals off formation.

OPEN-HOLE TREATING PACKER quickly locates and then treats lost circulation zones in open holes, with just one trip into the hole. Can be set, moved and re-set until zone is pinpointed, then blocking agent is placed through same packer. Lengthy anchor is not necessary because lateral expanding slip assembly makes this unique packer completely independent of the distance from the bottom of the hole.

CEMENTING SERVICES

284 SERVICE CENTERS . . . TO SERVE YOU BETTER

Here's a NEW WELDING TORCH that's WATERTIGHT... built for HEAVY-DUTY SERVICE ...yet weighs only 7 OUNCES!

This new HELIARC HW-18 Hand Welding Torch weighs only 7 ounces, making it easy for you to handle, less tiring. The special one-piece water cooling channel eliminates sources of leakage. And it's made for rugged, heavy-duty service.

YOU GET BETTER SHIELDING WITH LESS GAS

Improved design of collet body and closer electrode fit assure uniform argon flow, without jetting or turbulence.

◀ Diagram shows leakproof, one-piece water cooling passage in LINDE's new HELIARC HW-18 Hand Welding Torch.

GIVES YOU RUGGED SERVICE

Torch body is Fiberglas-reinforced phenolic for greater resistance to heat and thermal shock. Handle is tough, polished plastic. Gas cups have 4 times the impact strength of ordinary cups.

LEAKPROOF

Molded, one-piece water cooling passage has no joints to permit leakage—no water drip to contaminate welds.

EASY, MORE ECONOMICAL MAINTENANCE

Collets, collet bodies, cups and caps are interchangeable with those of your HW-17 Series 2 Torch. All couplings have standard IAA connections, and adaptors are included. Your production costs are lowered, too, for the new HW-18 saves time in hard-to-reach spots. Torch is designed for continuous 300-amp service, a-c or d-c.

ARGON SHUT-OFF VALVE

(Optional) saves time, steps and argon.

See and try this new HELIARC HW-18 Torch! For a demonstration, mail coupon today. Or call your distributor or nearest LINDE office. LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N. Y. Offices in other principal cities. In Canada: Linde Company, Division of Union Carbide Canada Limited.

Dept. O-73, LINDE COMPANY, Division of UCC
30 East 42nd Street, New York 17, N. Y.

Please advise me where and when I can examine and try out the new HELIARC HW-18 Hand Welding Torch.

NAME_____

COMPANY_____

STREET_____

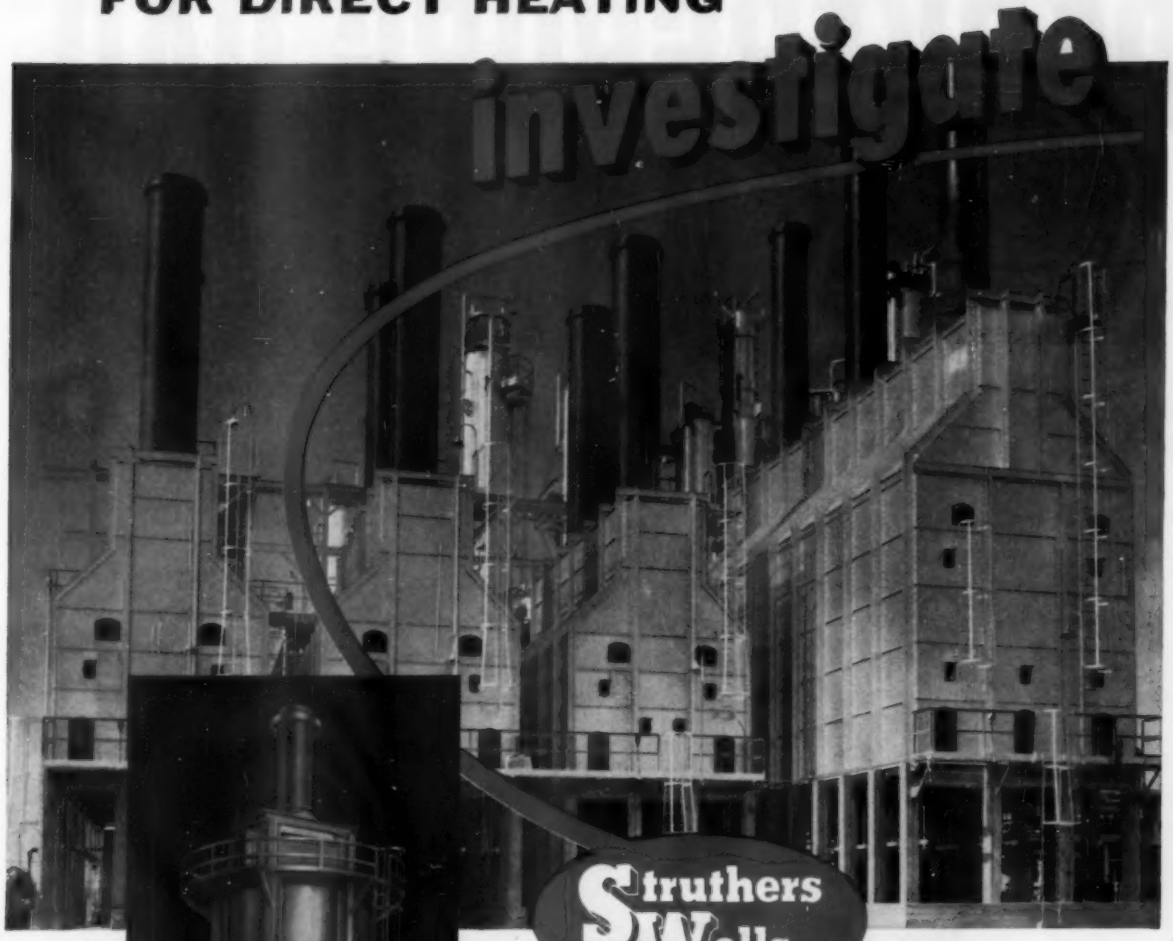
CITY_____ ZONE____ STATE_____

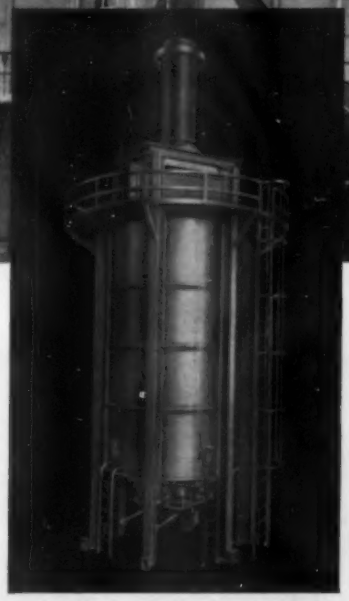
FOR THE BEST IN ELECTRIC WELDING LOOK TO *Linde* TRADE MARK

UNION CARBIDE

The terms "Linde," "Heliarc," and "Union Carbide" are registered trade-marks of Union Carbide Corporation.

FOR DIRECT HEATING





FIRED HEATERS

- Long, trouble-free Service
- High Thermal Efficiency
- Highest Temperatures and Pressures

For direct heating of liquids and vapors to temperatures about 1750°F, in any commercial pressure range, Struthers Wells can supply a wide variety of fired heaters to match your heating requirements.

Many units are being supplied to the petroleum and petrochemical industries, for direct heating of oil and hydro-carbon gases, and for cracking service. Equipment is supplied to heat gases to high temperature for chemical plant service, and for thermal and catalytic cracking of chemical compounds.

Heating units and complete systems have been supplied using circulating mediums, to temperatures above 1700°F.

Special heaters supply high temperature water or superheated steam, at high pressures.

Standard designs allow us to make quick quotations and fast deliveries, for most services.

Write on your letterhead for new Bulletin A-46, describing standard heaters.

STRUTHERS WELLS CORPORATION

WARREN, PENNA.

STRUTHERS WELLS PRODUCTS

PROCESSING EQUIPMENT DIVISION

Crystallizers . . . Direct Fired Heaters . . . Evaporators . . . Heat Exchangers . . . Mixing and Blending Units . . . Quick Opening Doors . . . Special Carbon and Alloy Processing Vessels . . . Synthesis Converters

BOILER DIVISION

BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

FORGE DIVISION

Crankshafts . . . Pressure Vessels . . . Hydraulic Cylinders . . . Shafting . . . Straightening and Back-up Rolls

PARKERSBURG DAU*

WELSORBERS AND WELDRIERS

Put Your Problem to Parkersburg's Engineering Know-How to show you where to locate a DAU Welsorber or Weldrier and give you an accurate picture of distillate recovery possibilities.*

**Dynamic Adsorption Units, a Parkersburg Original (Patented).*

PARKERSBURG ORIGINATED AND STILL LEADS IN DEHYDRATION-HYDROCARBON RECOVERY UNITS

1 Parkersburg originated unitized short cycle Dehydration-Hydrocarbon Adsorption Units in 1952.

2 The *only complete line* of Dehydration-Hydrocarbon Adsorption Units. Dehydration capacities from 1 million to 100 million standard cubic feet per day. Distillate recovery capacities from 7.5 Bbls/Day to 135 Bbls/Day stable stock tank oil.

3 Parkersburg units are ready to go *on-stream* when they are delivered to location. *No costly extra accessories are needed. No field insulation of towers is required.*

4 Parkersburg has trained technical personnel in all Production Equipment Division Branch offices capable of installing and operating DAU Welsorbers and Weldriers. No factory "experts" have to be flown in to iron out experimental "bugs".

5 Parkersburg DAU Units have been proven by six years of rugged testing and field service.

6 Parkersburg DAU Units are self-contained, with all necessary controls for completely automatic, unattended operation anywhere, regardless of location. No external source of energy is required. No shutdowns due to electrical and other power failures.

Factual Comparison

of the Parkersburg DAU with similar equipment now on the market.

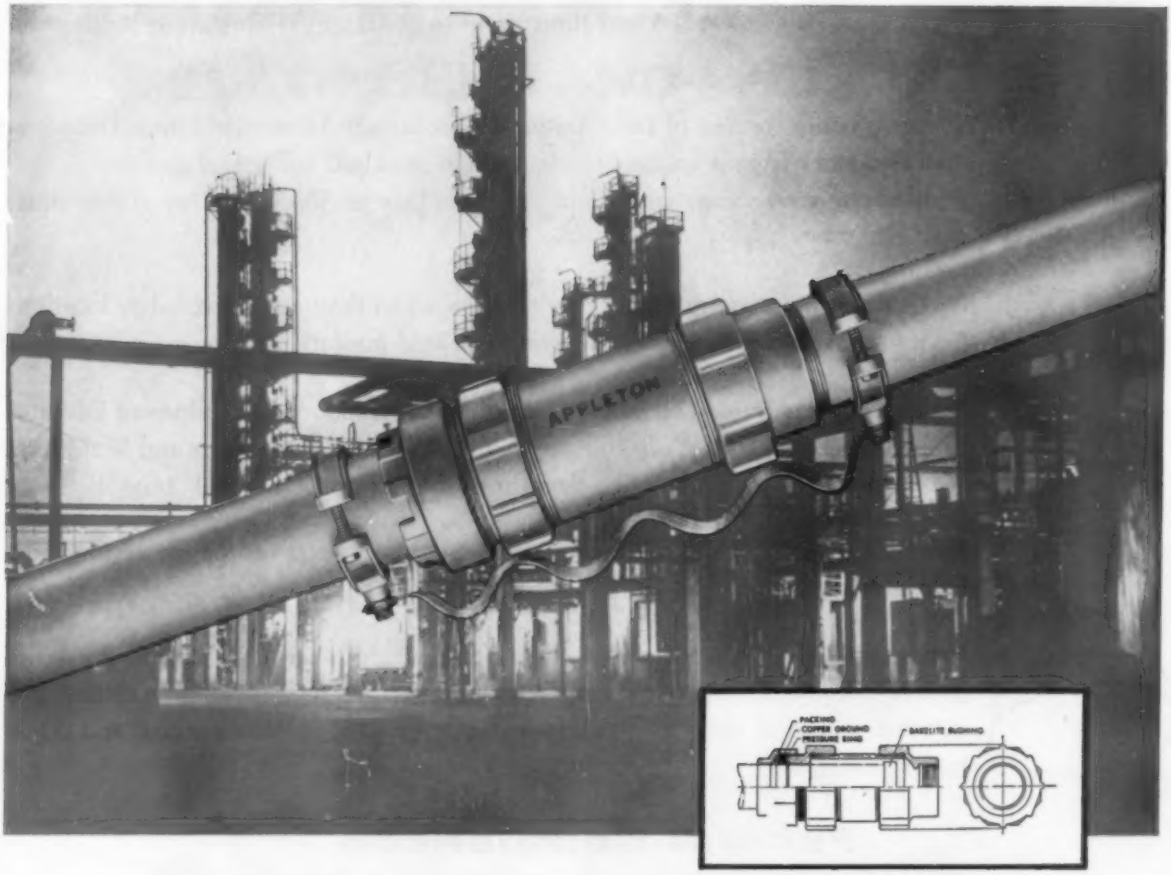
		Parkersburg	Unit X	Unit XX*
1	How many short cycle dehydration—hydrocarbon adsorption units are built and in operation?	72	3	1
2	How many years have these units been in operation in the field?	5½	1½	½**
3	How many different models of units are advertised as being available?	27	2	1**
4	Is power pump required for the operation of the unit?	NO	YES	YES
5	Is the unit complete with inlet separator as part of the "package"?	YES	NO	NO
6	Are any units operating on offshore platforms?	YES	NO	NO
7	Are any units operating in sub-zero climates?	YES	NO	NO
8	Are any units operating on hot compressor discharge gas?	YES	NO	NO
9	Are any units processing full wellstreams, serving as separation, dehydration, AND hydrocarbon recovery equipment?	YES	NO	NO
10	Are any units "riding" gas pipelines, serving as dehydration and hydrocarbon recovery equipment?	YES	YES	YES**

*Conventional Unit, converted to short cycle for experimentation
**Experimental Unit

You can put your problem to PARKERSBURG'S ENGINEERING KNOW-HOW . . . the same know-how that originated and still leads in dehydration-hydrocarbon recovery units.

THE PARKERSBURG RIG & REEL COMPANY
Division of Parkersburg-Aetna Corp.
PRODUCTION EQUIPMENT DIVISION OFFICES: P. O. BOX 13295, HOUSTON 19, TEXAS

APPLETON® "XJ" Conduit Expansion Joints



Relieve the *strain* of expansion and contraction on long runs of rigid conduit

Temperature changes place a terrific strain on all long conduit runs. To relieve this potentially dangerous condition, it is best to install APPLETON "XJ" Expansion Joints at frequent intervals along the entire system. These weatherproof joints, for use with heavy-wall conduit, have a metallic packing and a bonding jumper to assure the entire conduit system remains a continuous electrical conductor. The jumper, installed in accordance with U. L. recommendations, gives double protection against extreme expansion movement reducing the effectiveness of the metallic bond.

As the conduit is inserted in the joint, a bushing is placed on the end in the manner shown. This bushing permits maximum conduit movement and yet the conduit can never pull free of the joint. The APPLETON "XJ" Conduit Expansion Joint features a metallic packing and pressure ring at the flexible end to keep the joint weatherproof at all times.

Wherever a long run conduit installation exists, the need for APPLETON "XJ" Expansion Joints exists. Interior or exterior, from Texas to Maine, temperature strains do exist, so take advantage of APPLETON'S product research program to give you the precision products you require . . . APPLETON "XJ" Weatherproof Expansion Joints for all long run conduit installations.

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The setting of 357 lengths of casing was accomplished in less than 24 hours.

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- **NEW** Unitized controls, conveniently located in a single console, result in greater operational efficiency.
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- **NEW** Self-equalizing 48" diameter brakes designed for rapid, drag-free release and smooth feed-off operation.
- **NEW** Fawick VC clutches mounted on the drum shaft for low and high drives, with an emergency splined clutch provided for the low drives.

The U-712-A is designed as an integral drilling unit which includes hoisting drum, transmission, rotary drive and auxiliary brake. For complete information, write for our U-712-A Bulletin or contact your local Mid-Continent representative.

DWJ-8

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Denver, Colorado	Kansas City, Missouri	Omaha, Nebraska	Shreveport, Louisiana	
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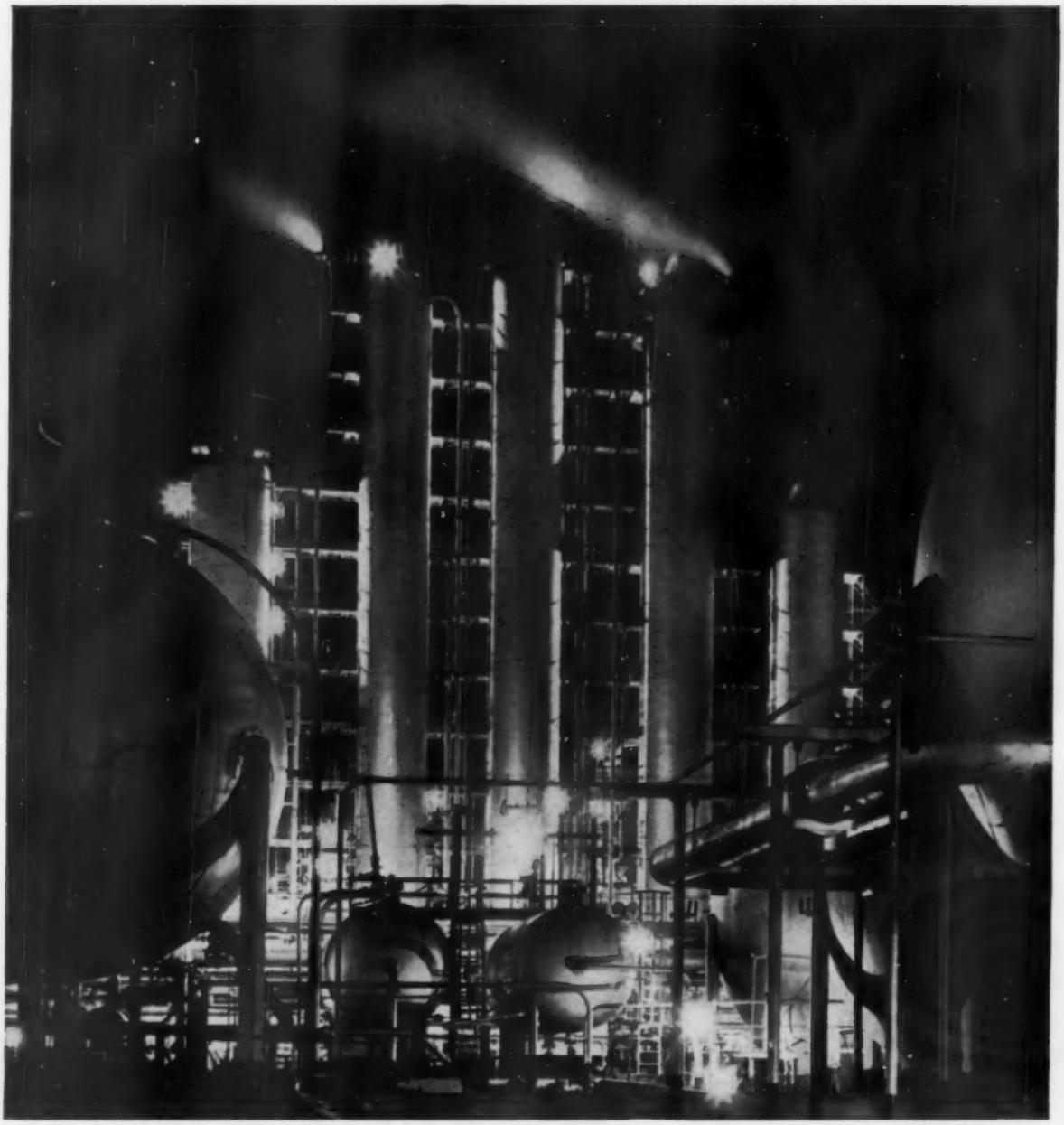

"... the oil industry expanded very rapidly since World War II, and like other industries it is undergoing adjustment and reappraisal. However, nothing in the long-term outlook has diminished our confidence in an expanding future for our industry. The need for our products will grow steadily, and our problems lie in the direction of meeting those needs through the most efficient use of capital and at the lowest possible cost of operations, and not in losing our long-range perspective because of a temporary recession."

—M. J. Rathbone, President, Standard Oil Company (New Jersey)

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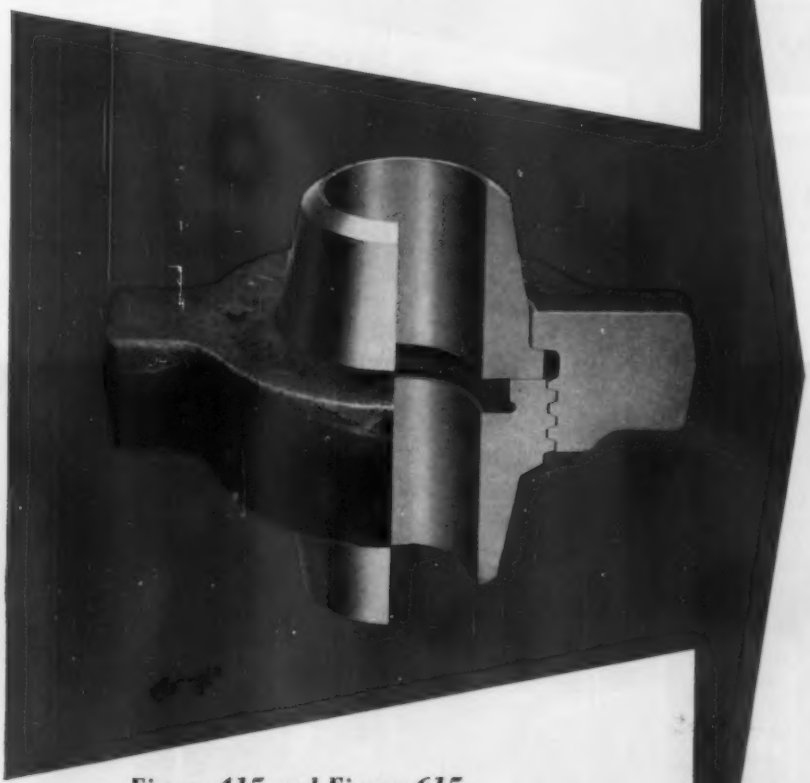

Figure 415 and Figure 615
Sizes: 2", 3", 4"
Pressures: 4000 psi test and 6000 psi test

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HOUSTON, TEXAS

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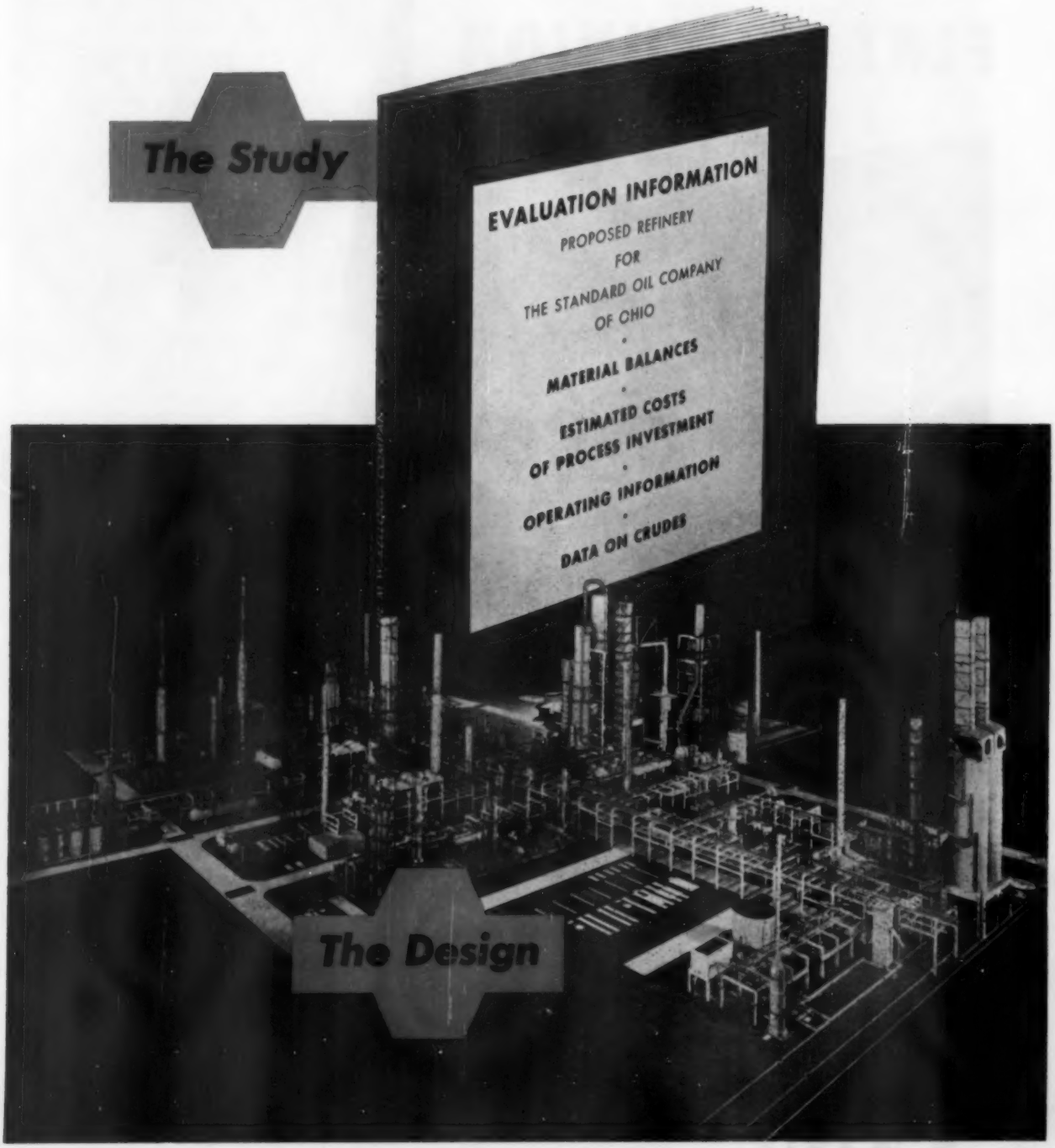

To achieve the ultimate in design, yet assure the most economic plant, Kellogg built this 26' x 29' scale model concurrently with designs to assist all levels of management, as well as all categories of engineering and refinery personnel, in design reviews well in advance of major construction.

Economic Achievement

When refining capacity must be increased, an oil company's planning group has to evaluate the technical and economic pros and cons of modernizing by degree or scrapping outmoded facilities and rebuilding completely. When the decision is to start from scratch, hundreds of variables are involved in choosing location, type and range of crudes, product mix, process line up, degree of integration, and refinery size. Which combination will insure the optimum in efficiency, economy, yields, flexibility for the future, and return on investment?

Faced with exactly this time-consuming multiplicity of problems, The Standard Oil Company of Ohio first scheduled decision deadlines for each planning phase, then called upon Kellogg for refinery material balances, estimated process investment costs, operating information, and data on various crudes. Decisions from this study, each made on schedule, served as the blueprint for Kellogg's second assignment—engineering and constructing an integrated new plant at Toledo, Ohio. Designed for a capacity of 60,000 BPSD, this $40 million refinery is an outstanding example of sound economics at work in plant planning and execution.

With most oil companies concerned with tomorrow, there is no better time to be discussing future plans and problems with Kellogg than today. Kellogg's Contract Sales Division welcomes the opportunity to put its coordinated engineering, procurement, and construction services at your disposal.

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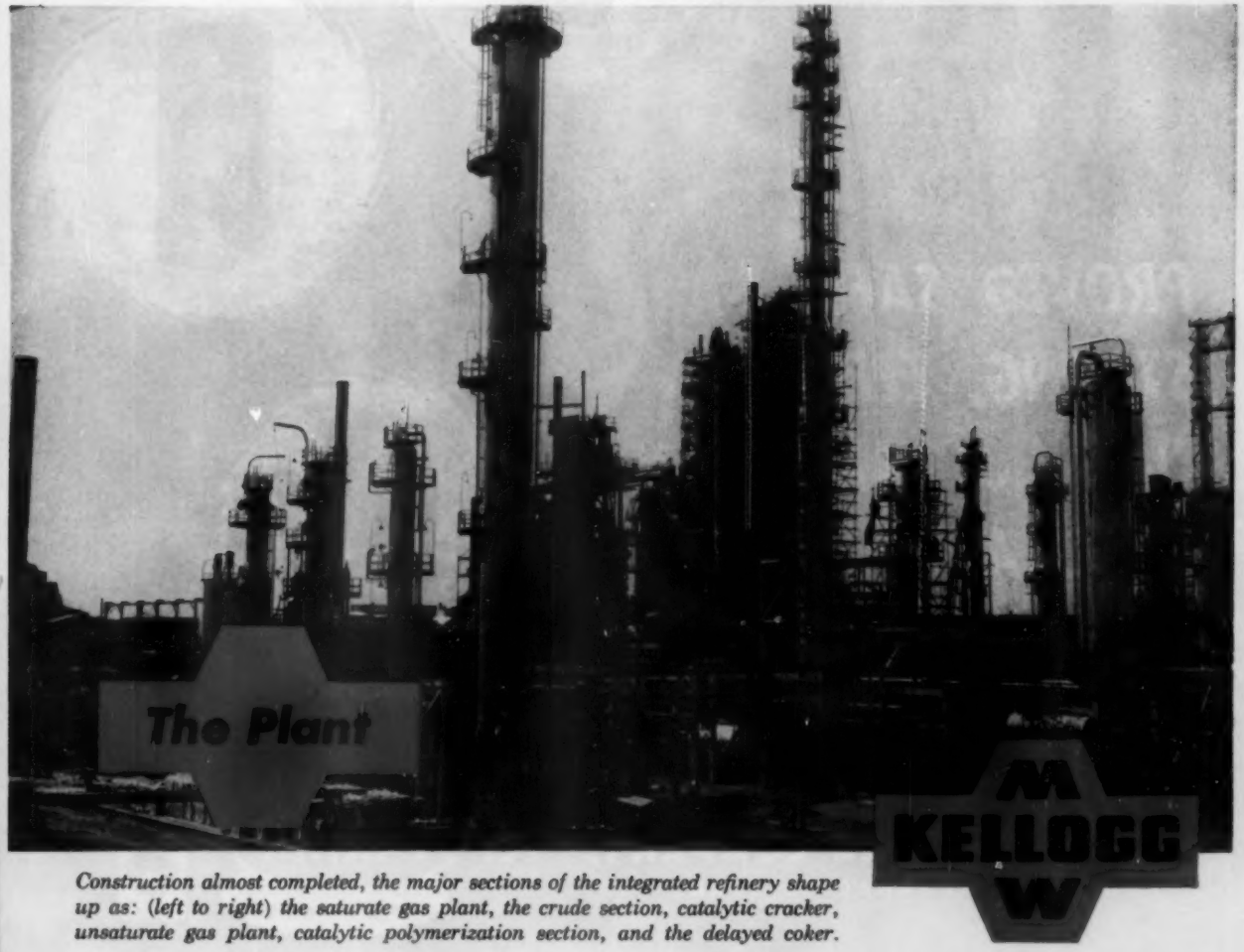
For the complete story on this refinery, send for our new 20-page Kelloggram



Construction almost completed, the major sections of the integrated refinery shape up as: (left to right) the saturate gas plant, the crude section, catalytic cracker, unsaturate gas plant, catalytic polymerization section, and the delayed coker.

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They Say—

Arbuckle in Grigston pool?

Dear Sir:

In your interesting article, page 125 of The Oil and Gas Journal, June 30, you use the Grigston pool of Scott County, Kansas, as an example of Arbuckle production. If memory serves me correctly, there have also been other Journal articles which made mention of Arbuckle production in Scott County.

I and many other Kansas geologists feel certain that the Arbuckle pay reported in the discovery well of that pool is false. The very fact that the same operator completed two offsets in the Mississippian and drilled a step-out dry hole, with none of the three completely penetrating the Mississippi lime, is a tip off that the discovery well also gets its production from the Mississippian.

In my opinion, continued reference to Arbuckle production in that area is compounding an error which may cause future operators unnecessary expense and grief.

R. A. Carmody
Consulting Geologist
Wichita

(Editor's note: Journal records are confirmed by scouting reports, which say Grigston field has both Arbuckle and Mississippian production.)

IOCC limits set by Congress

Dear Sir:

In regard to your editorial of June 30 ("Conservation Needs New Stimulus and Direction," p. 39), I hasten to write you to call respectful attention to the fact that Texas has been active in doing many, if not all of the things suggested in the editorial.

We have—the Texas Railroad Commission—been aggressive in giving liberal discovery allowables, constantly broader spacing, encouraged multiple completions of wells even up to quadruple completions, encouraged by big allowables pressure maintenance and repressuring and flooding (see your first story page 41 on Seeligson), automatic custody metering, and simplification of reporting—and Texas' reserve producing ability is very great.

We have led the way in requiring reports on exports, past and future expectations.

We have required that stocks be reduced to adequate working levels.

We have worked for years on model suggested statutes for new oil and gas producing states and through the excellently attended meetings of the compact legal committee have given full and complete discussions on the latest decisions, rules, and regulations.

The Compact Commission is not an industry association and its meetings are not, or at least were never intended to be, industry conventions. The compact is a treaty between the sovereign oil producing states. Its workings should be the exchange of ideas and experiences of the duly elected or duly appointed officers of the oil states signatory to the treaty.

If the industry is permitted to furnish, as you say, "contributions of leadership, guidance, brainpower, and manpower from the industry" you must be warned that the compact will be rendered useless because a simple reading of the treaty between the states (the compact) as agreed upon by the signatory states and approved by the Congress, does not contemplate and never did contemplate that anyone but the sovereign states were permitted to combine their respective police powers as set out in the compact.

I trust you will reread the compact. Our conduct—that of the compact officers—has been reviewed by the attorney general's department and no criticism is to be found in the report.

If industry is permitted to take the "leadership, guidance, manpower, and brainpower" of the compact then it will require a different charter from the Congress to operate. The compact does not now so provide.

Ernest O. Thompson
Texas Railroad Commission.

CALENDAR

JULY

23-26 Wyoming Geological Society, thirteenth annual field conference, Powder River basin.

24 Illinois Oil and Gas Association, American Petroleum Institute, joint meeting and annual oil men's outing, Meadow Woods Country Club, Centralia, Ill.

25 Southern Gas Association, round-table conference on compressor station operation, transmission gas measurement superintendents' round-table, St. Anthony, San Antonio, Tex.

AUGUST

11-14 Society of Automotive Engineers,

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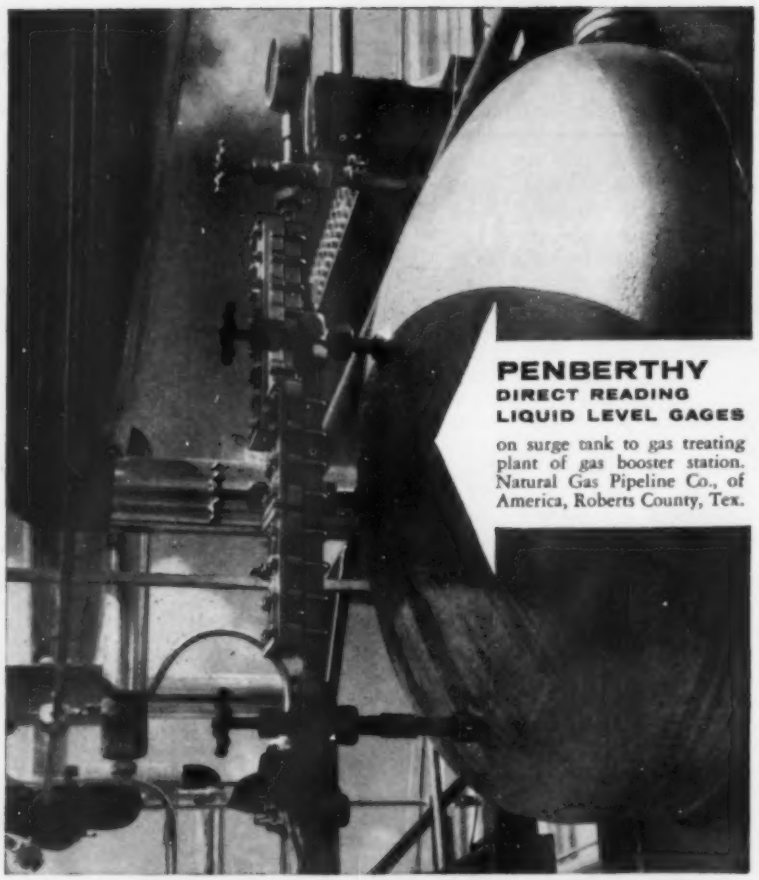

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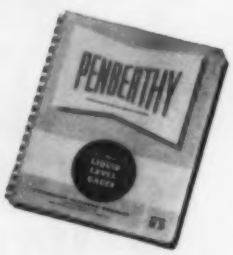

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National West Coast meeting, The Ambassador, Los Angeles.

18-19 North Dakota Oil and Gas Association, annual meeting, Grand Pacific Hotel, Bismarck, N. D.

18-20 American Institute of Chemical Engineers, American Society of Mechanical Engineers, second annual heat-transfer conference, Edgewater Beach Hotel, Chicago.

19-22 American Institute of Electrical Engineers, general meeting, Sacramento.

20-23 Alberta Society of Petroleum Geologists, eighth annual field conference, Nordegg, Alta.

25-27 Appalachian Gas Measurement Short Course, University of West Virginia, Morgantown, W. Va.

SEPTEMBER

7-12 American Chemical Society, fall meeting, Chicago.

10-12 National Petroleum Association, fifty-sixth annual meeting, Traymore Hotel, Atlantic City, N. J.

10-13 Intermountain Association of Petroleum Geologists, ninth annual field conference, Paradox basin.

14-19 Instrument Society of America, thirteenth annual instrument-automation conference and exhibit, Convention Hall, Philadelphia.

15-16 Independent Natural Gas Association of America, annual membership meeting, Roosevelt Hotel, New Orleans.

15-17 American Institute of Electrical Engineers, conference on petroleum, Baker Hotel, Dallas.

18 Natural Gasoline Association of America, Rocky Mountain regional meeting, Gladstone Hotel, Casper, Wyo.

18-20 Rocky Mountain Association of Geologists, field trip, Maroon basin, registration, Glenwood Springs, Colo.

21-24 American Society of Mechanical Engineers, petroleum division, mechanical engineering conference, Cosmopolitan Hotel, Denver.

24-25 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

25-26 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual meeting, Roosevelt Hotel, New Orleans.

29-Oct. 3 Society of Automotive Engineers, national aeronautic meeting, aeronautic production forum, and aircraft engineering display, The Ambassador, Los Angeles.

OCTOBER

1-2 Western Petroleum Refiners Association, third annual stream-pollution and waste-disposal conference, Lassen Hotel, Wichita.

1-3 American Association of Oilwell Drilling Contractors, eighteenth annual meeting, Adolphus and Baker Hotels, Dallas.

3 American Institute of Chemical Engineers, South Texas section, thirteenth annual technical meeting, Moody Center, Galveston, Tex.

5-8 Society of Petroleum Engineers of AIME, fall meeting, Houston.

5-8 National Association of Corrosion Engineers, northeast region, Somerset Hotel, Boston.

7-8 Texas Mid-Continent Oil and Gas Association, annual meeting, Statler-Hilton Hotel, Dallas.

9-10 California Natural Gasoline Association, thirty-third annual fall meeting,

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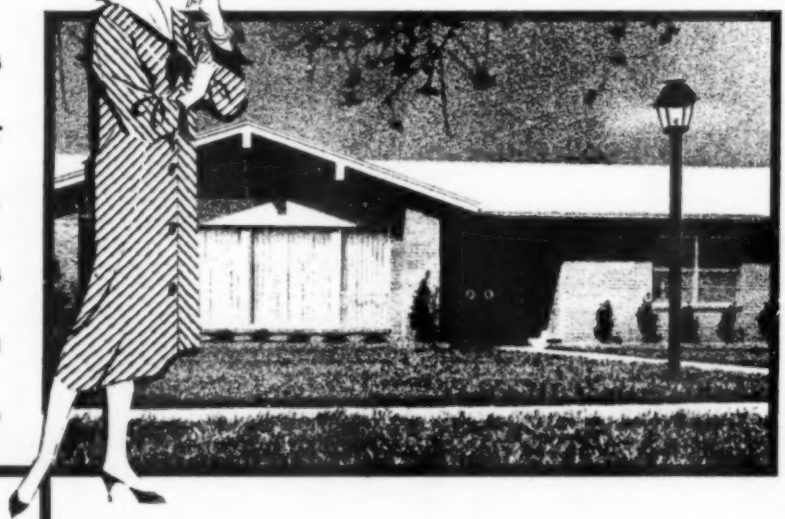

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LITTLE ROCK, ARKANSAS.

Huntington-Sheraton Hotel, Pasadena, Calif.

10-12 Tri-State Oil Show, Roberts Municipal Stadium, Evansville, Ind.

12-18 OIL PROGRESS WEEK.

13-15 American Gas Association, annual convention, Atlantic City, N. J.

13-15 American Society of Mechanical Engineers, American Society of Lubricating Engineers, conference on lubrication, Statler Hotel, Los Angeles.

13-16 Society of Exploration Geophysicists, annual meeting, Hotel Gunter, San Antonio, Tex.

13-17 American Society of Civil Engineers, annual convention, Hotel Statler, New York.

15-16 South Dakota Independent Oil Men's Association, convention, Sheraton-Johnson Hotel, Rapid City.

15-16 University of Kansas, Southwest Kansas Center, sixth annual Gas Measurements Institute, Liberal, Kans.

15-17 National Association of Corrosion Engineers, north central region, Cincinnati.

16-17 Society of Petroleum Engineers of AIME, Southern California petroleum section, Biltmore Hotel, Los Angeles.

16-18 New Mexico Geological Society, Arizona Geological Society, ninth annual field conference, Black Mesa basin, registration Gallup, N. M., Oct. 15.

19-21 National Association of Oil Equipment Jobbers, annual convention and trade show, Hotel Adolphus, Dallas.

20-24 National Association of Corrosion Engineers, south central region, Roosevelt Hotel, New Orleans.

22-23 National Association of Corrosion Engineers, western region, corrosion control course, U. S. Grant Hotel, San Diego, Calif.

22-24 Southwestern Federation of Geological Societies, technical meeting, Mineral Wells, Tex.

22-24 Society of Automotive Engineers, national diesel engine meeting, Lord Baltimore Hotel, Baltimore.

23-24 Rocky Mountain Oil and Gas Association, annual fall meeting, Town House Motel, Omaha.

23-24 Western Petroleum Refiners Association, refining technology and industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

27-28 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

26-31 American Institute of Electrical Engineers, general meeting, Pittsburgh.

NOVEMBER

5-6 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-7 American Association of Petroleum Geologists, Pacific section annual meeting, Los Angeles.

10 Transportation Club of the Petroleum Industry, annual meeting, Bismarck Hotel, Chicago.

10-13 American Petroleum Institute, thirty-eighth annual meeting, Conrad Hilton, Palmer House, and Congress hotels, Chicago.

18-20 Ninth National Conference on Standards, Hotel Roosevelt, New York.

20-21 American Society of Civil Engineers, structural division and Kansas City section, conference on electronic computation, Kansas City.

A 6000#/24 hr. capacity W&T chlorinator is used on the central cooling water system at Marcus Hook, Penna. refinery of Sinclair Refining Company.

W & T CHLORINATION . . .

the economical way to prevent slime in cooling waters

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These tool joints have completed 22,000 feet of hole. Hard-faced with Coated Tube Stoodite, they still show little wear

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NOTE: There is of course no substitute for Stoody Tube Borium on tool joints in highly abrasive formations where maximum wear resistance is required.

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TULSA, OKLAHOMA

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JOURNALLY SPEAKING

Illuminating Gas

IT'S BEEN official for a couple of months now that the Journal has a new editor at the helm. But only now is George H. Weber getting settled down to the routine of riding herd on the staff of more than 40 writers and seeing that the magazine gets to press with all its pages intact.

Up to now he's been occupied chiefly with such things as winding up his old job as refining editor in New York, selling his house in Connecticut, finding a place to live in Tulsa, and taking a vacation to prepare for the editorial headaches piling up for him here.

So this is a good time to let our readers in on what George's old colleagues and associates in New York think of him—or at least what they told him they think of him. It seems that when his imminent departure from Gotham was announced, a bunch of refinery engineers and research scientists gave him a farewell party.

They didn't permit any soft-soap sentiment to creep into the hilarity of the send-off, and their speeches got more insulting as the evening wore on. Finally, at the psychological moment, they distributed the following "press release," complete with picture of Ye New Ed cut down to what they said was his proper size:

"NEW YORK, N. Y.—George Hydrocarbon Weber, one of the world's foremost authorities on horizontal shell still refining, has been named Top Dog of The Oil and Gas Journal, a weakly magazine.

"Weber, who has long contended that 'cracking and other new-fangled processes will never work,' says the magazine will continue to push for the recognition of illuminating gas as the most valuable oil-refinery product.

"'All this nonsense about tailor-made superfuels from oil is so much rot,' he told the Wide, Wide World Petroleum Congress a few years ago. 'The oil industry has got a good thing in illuminating gas, and they ought to be careful about getting too diversified.'

"In the past he has also blasted so-called continuous refining methods. 'The old coal-fired batch stills worked fine,' he has charged. 'They were crazy to ever change.'

"Weber earned his degree in petroleum engineering from Oklahoma University in the days when the school had a lousy football team. He's been a Journal-ist for some 23 years—and, as he says, 'it's been **some** 23 years.'

"The magazine has never been quite sure where to put him. They've tried him in Texas, Louisiana, New York, and the Wonder Bar in downtown Elizabeth, N. J. Now, as Greeley advised, he's going West.

"Weber is a native of Gowanda, N. Y., which is at least something."

We reprint this "press release" for three reasons:

1. It shows George's industry contacts like him. Otherwise they wouldn't have said nasty things about him without meaning them. They would have made complimentary farewell speeches without meaning them.

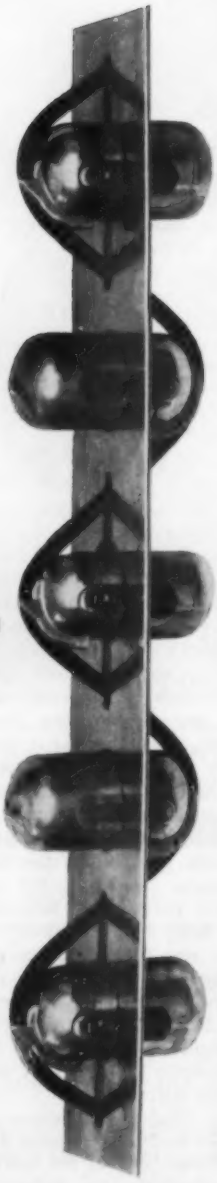
2. It shows George gets along well with his contacts. Otherwise he would have been insulted instead of thinking that this was the funniest thing that's happened to him since he left the farm.

3. It shows George is generous. Otherwise he wouldn't have let us print this and we would have had to dream up something else to fill this column.

—Henry D. Ralph

THE WELEX
HORNET
JET

ORIGINATORS OF Welex JET PERFORATING



New Welex Hornet Jet Penetrates Deep and Fast

The new Welex Hornet Jet is an old pro in a new role. Utilizing the famed Welex 1⅛" Swing Jet perforating charge, the Hornet Jet stands on the performance and dependability records already established by the Swing Jet. Standing head and shoulders above anything else in its class, the Hornet Jet has a new spring steel strip carrier designed to perforate long pay zones in a single run, to leave a minimum of debris and to put a large dependable charge into small OD liners.

Compare these features with any comparable perforator in field use today:

For Performance

Entrance Hole	.57"
Penetration Depth	9.10"

Shot through one-half inch of water into ¾" steel plate and neat cement.

For Dependability

- Uses Swing Jet charge for best results.
- Steel strip carrier reduces debris.
- All expendables are aluminum.
- One to four charge per foot are run at 180° phasing in the strip.
- Flexible enough to go through tight spots in casing and liner.
- Large bull nose and sinker bar assure easy entry into casing top.
- Charges adjust to 3¼" or 4" OD for optimum clearance in casing.
- Long sections perforated on one run save expensive rig time.

The Welex Hornet Jet is another innovation by Welex to meet the demands of oil men everywhere for better perforating on every job.

WELEX, INC.

P. O. Box 11336, Fort Worth, Texas

Division Offices in Denver, Houston, LaHabra, Midland, New Orleans, Tulsa and Wichita. Districts in every major oil center. Subsidiaries in Canada, Peru and Venezuela.

Too much gasoline is our weakest spot now

THE significant factor in the domestic petroleum situation today is the failure of refiners to realize how weak the gasoline market still is. In spite of its good start toward recuperation, gasoline is still far from robust.

There is a real danger that too much optimism over the near-term outlook, too much eagerness to resume high-level activity, could bring on a relapse and send the industry back to its sickbed of last spring.

The recent high runs and continued high gasoline stocks threaten to undermine all the corrective work of the past 6 months in bringing down excess crude production, imports, and inventories.

IT IS TRUE THAT TOTAL DEMAND is now slightly above last year for the first time since the Suez Canal closed, but the jump in products manufacture has been out of proportion to the moderate increase in demand. It is also out of proportion to the crude supply, thus causing an imbalance of stocks with too high a portion of total inventories in finished products.

The most disturbing result of the refiners' optimism is that gasoline stocks at midsummer are far too big for any foreseeable contingency. True, they are down to what they were last year, but that's not low enough. Both in 1957 and 1956 the industry went into the fall with excessive gasoline in storage. A repeat performance this fall could keep the market depressed all winter.

It must be remembered that as soon as the heating season starts, refinery runs will be stepped up to meet the distillate demand. And then, even though the yield pattern may be shifted some, more gasoline will be made perforce and stocks will rise during the period of its lowest consumption. Failure to reduce gasoline stocks now forebodes trouble for months to come.

GASOLINE PROVIDES the bulk of the money to run the entire oil industry. For too many months an excess of it seeking a market has depressed its price, weakened crude prices, and cut the industry's operating revenue.

Now, at long last, the gasoline market shows signs of beginning to stiffen. But this trend could quickly die a-borning if refiners view it as a sign that all troubles are over and throw caution to the winds.

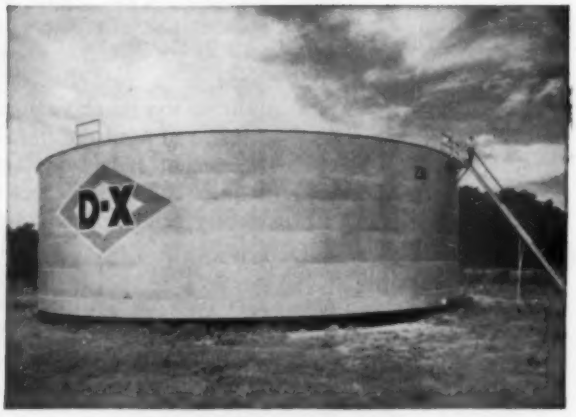
The new Middle East crisis does not alter this situation. There is ample unused refining capacity to fill any sudden emergency. And an emergency is likely to draw less heavily on gasoline than on other oils. The time to correct the gasoline imbalance is right now.

How 4 big companies cut evaporation loss with "Microballoon"* spheres...

Savings up to

SOHIO—THREE YEARS

of savings have shown the effectiveness of this evaporation control method. The layer of "Microballoon" spheres in each tank on this five-tank farm is still intact. Four tanks have a 7-day cycle with 7 RVP oil. Fifth handles 4 to 5 RVP oil on 23-25-day cycle.

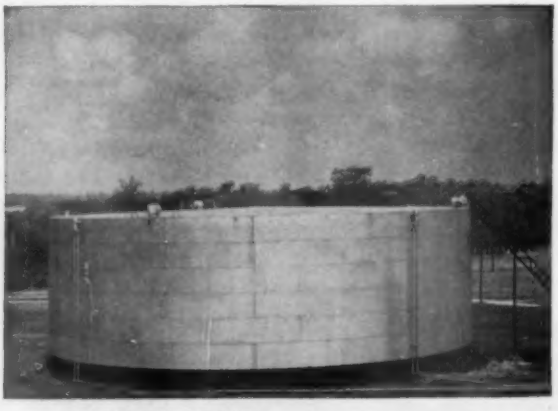


D-X SUNRAY—THREE YEARS

ago a layer of "Microballoon" spheres was installed in this 350,000 bbl. working storage tank. About 6,700,000 bbl. of select crude and mixed crude-casinghead gasoline have been pumped through, with vapor loss cut an estimated 70-80%. Tank is pumping or receiving 80% of the time.

COSDEN—THREE YEARS

after installing 4500 lbs. of "Microballoon" spheres in each of these tanks, an average of 1,500,000 bbl. have been pumped through per year. The foam seal is still at work, stopping evaporation an estimated 75%. Tanks handle sweet crude with high gravity—about 37° to 45° API. Gas content—40 to 50%.



SINCLAIR—THREE YEARS

of service in this cone-roofed tank have shown how much the layer of "Microballoon" spheres can save. A 50 per cent cut in evaporation loss is estimated, and other tanks at the site are due for the same treatment. Tank's average temperature is 75 deg. F., RVP is 5.6 psi.

*Registered trade-mark of The Standard Oil Co. (Ohio)

80%...year after year!

Evaporation loss was cut as much as an estimated 80 per cent for the cone-roofed tanks shown at left. For several years, these tanks have been equipped with a layer of "Microballoon" spheres. These microscopic hollow spheres of BAKELITE Brand Phenolic Resins form a blanket that floats on the surface of crude oil, preventing escape of costly volatiles.

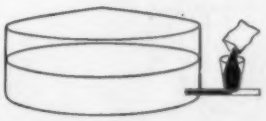
If you are seeking an inexpensive, convenient, quickly-installed method of controlling evaporation loss, these case histories prove that this is a good place to begin. Learn how "Microballoon" spheres made from BAKELITE Phenolic Resins can work for you. Write Dept. GG-15E.

FOR EVAPORATION CONTROL

BAKELITE
BRAND
RESINS

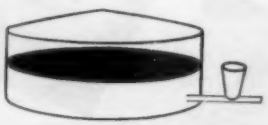
UNION CARBIDE

HOW "MICROBALLOON" SPHERES WORK TO CUT EVAPORATION LOSS



1 **"Microballoon" Spheres are mixed with oil being pumped into the tank.**

2 **They immediately start floating to the oil surface, form a blanket in a few hours.**



3 **The blanket seals the entire surface within the tank. This surface seal cuts evaporation loss.**

BAKELITE COMPANY, *Division of Union Carbide Corporation,* 30 East 42nd Street, New York 17, N. Y.
In Canada: Bakelite Company, Division of Union Carbide Canada Limited, Belleville, Ontario
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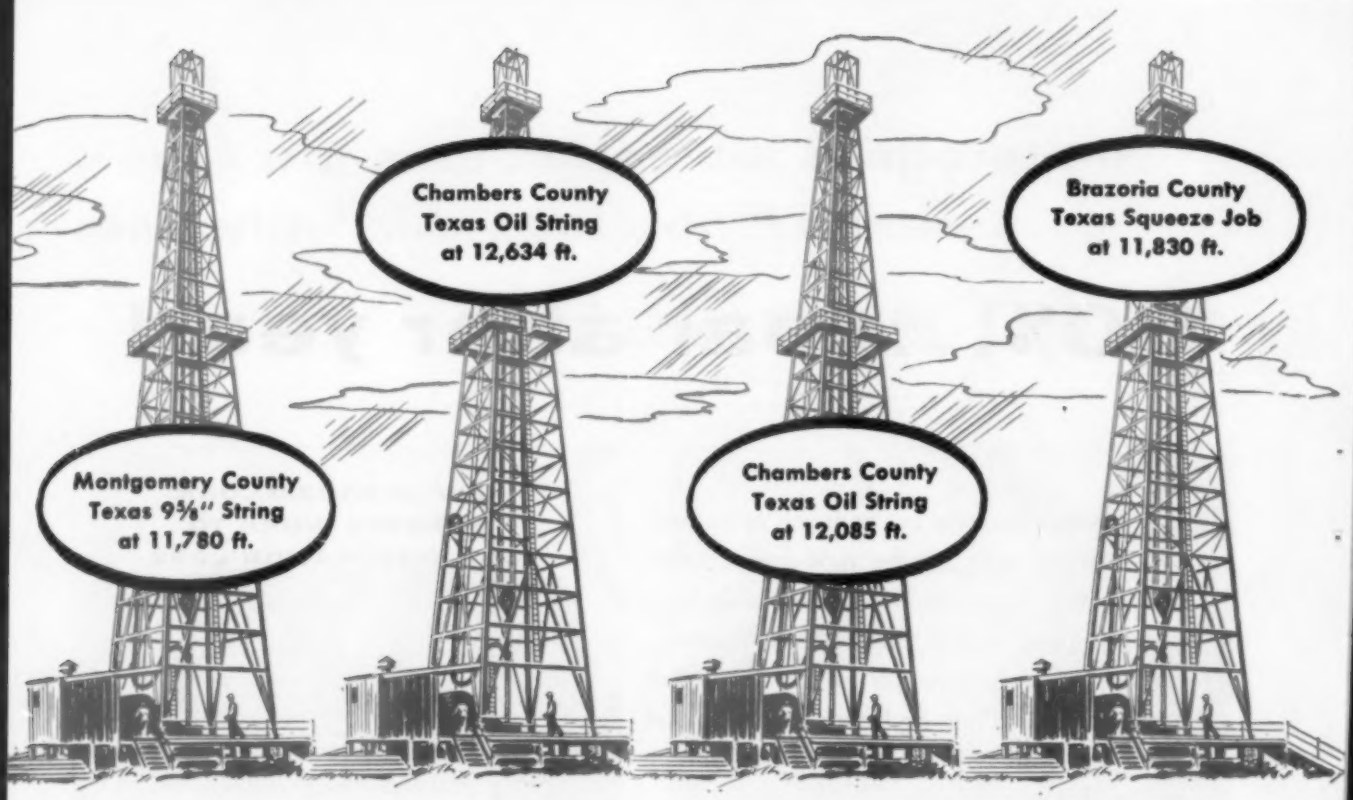

AS TEXAS GULF COAST WELLS GET DEEPER AND HOTTER

'Starcor' Gives Outstanding Performance

...NOW, AS IN 1936

Select Cement to Fit the Job!

● Back in 1936, few wells were drilled below 7500-8000 ft. In some fields, temperatures ranged from 185 to 200°F, with high pressures. Pumping equipment was a long way from what it is today. Operators were often hard pressed to get a good cementing job with "common" cement.

A slow-setting cement was needed—'STARCOR' SLOW-SETTING OIL WELL CEMENT met that need, met it well, as shown by the fact that wells cemented with 'Starcor' a generation ago are still producing, the original cementing jobs holding tight.

Equally outstanding is today's 'Starcor' performance at the greater depths made possible by improved equipment and methods. In the deep, hot Texas Gulf Coast wells, for example (typical jobs, listed above), 'Starcor' is performing perfectly, adding a new chapter to a distinguished service record.

Lone Star offers you four great cements: LONE STAR Cement, standard of highest quality for half a century...'INCOR'*, America's FIRST High-Early, Sulphate-Resistant Cement...'STARCOR'* Slow-Setting Oil Well Cement...'TEXCOR'* Deep Oil Well Cement. Select the one that fits your job—the extra quality margin is important to you.

*Reg. U.S. Pat. Off.

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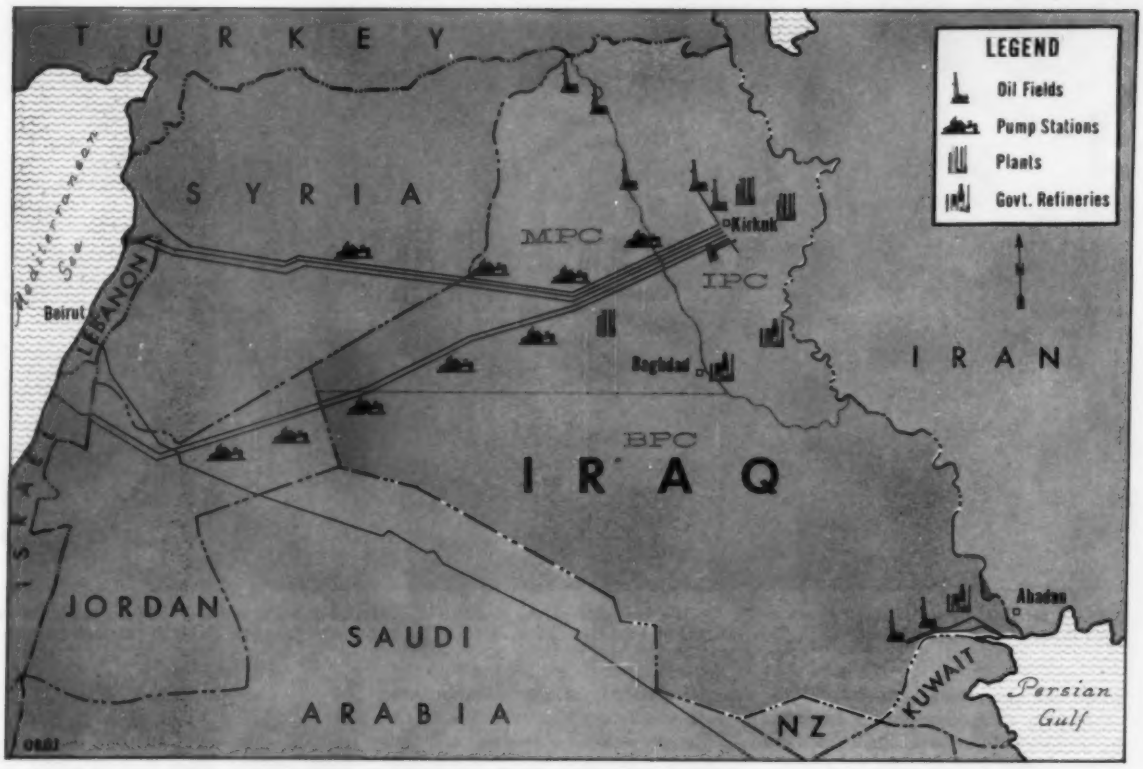


What the Middle East Crisis Means

MIDDLE EAST oil is the one fuel that will power the massive machine ambitious Gamal Abdel Nasser is building to carry him to head an all-Arab empire.

His rallying cry for powerful Pan-Arab world has been met with cold suspicion by most established governments of other Arab nations, but it has been a siren's song to Arabs individually.

Western nations dependent on Middle East oil have long viewed Nasser's ambition with misgivings. Last week the misgivings became alarm.

Last week for the first time since Nasser himself seized the Suez Canal 2 years ago and shut off the flow of oil to Europe's thirsty markets, his Arabic admirers could almost grasp the oil supply itself.

The military coup in Iraq staged by Nasser's followers is the first real thrust at the vitals of much of the world's oil supply. If Nasser's Iraqi admirers are fully successful, there is a real danger that other Middle East oil kingdoms will fall to Cairo-inspired revolts.

This type of chain reaction can, and perhaps will, create the wily Egyptian's Arab empire. It would place him firmly astride a 4-million barrel daily oil supply vital to Europe and much of the rest of the world.

In such a position there would be no logical reason for Nasser to shut off this oil. But, the highly emotional Egyptian leader has demonstrated that he's not always guided by logic.

Oil still flows . . . Oil operations throughout the Middle East were continuing normally last week in spite of armed revolts in both Iraq and Lebanon, and the landing of U. S. troops at Beirut.

Iraq's big Kirkuk field in the north of the country was still producing normally. About 510,000 bbl. daily was still moving through the Iraq Petroleum Co.'s pipeline system to eastern Mediterranean ports. Tanker-loading operations at both Banias and Tripoli were normal.

Loadings were also continuing at Fao, the much smaller loading terminal at the head of the Persian Gulf in southern Iraq.

The biggest immediate threat to oil appeared to be in the danger of some "unofficial" action by Arab nationalists in Iraq, Syria, or Lebanon aimed at the vulnerable pipelines crossing these countries.

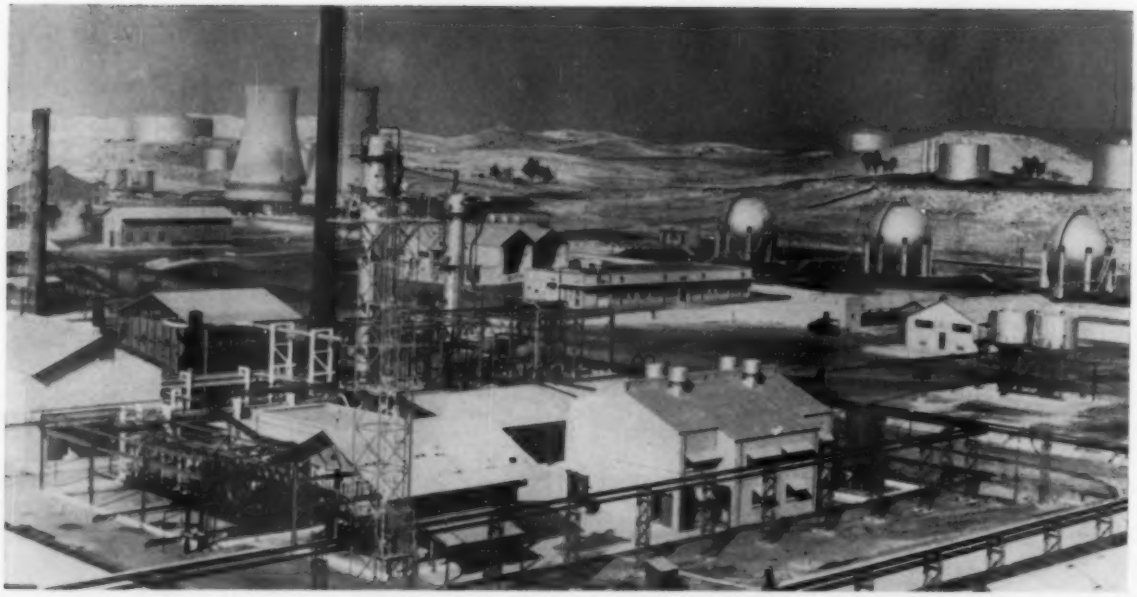
When the British-French-Israeli invasion of Egypt took place at the time of the Suez closing, irregular partisans in Syria took matters in their own hands and blew up two IPC pipeline stations. This could happen again.

If Arab nationalist followers of Nasser should react violently to the U. S. action of landing troops in Lebanon, they might also attack Trans-Arabian Pipe Line's system linking Saudi Arabian fields with Sidon.

If both lines should be put out of operation, the flow of almost 900,000 bbl. of Middle East oil daily to Europe would be stopped. IPC got its system back to normal throughput of 500,000 to 525,000 bbl. daily only 2 weeks ago, recovering from the previous sabotage.

Tapline, with recently installed booster stations, moves about 375,000 bbl. daily to the Mediterranean. This line was left untouched in the last flareup of Middle East violence.

Another 1,800,000 bbl. of Middle East crude moves through the Suez Canal daily. It is considered unlikely that Nasser would close the canal again in a purely political move. If the Middle East should flare into a full scale shooting war at almost any point, Egypt would probably close the canal.



KIRKUK process plant of Iraq Petroleum Co. in the foothills of the Kurdish Mountains puts 20 million tons of crude oil a year through a stabilization process. This rids oil of corrosive gases before the crude is pumped to Mediterranean terminals.

Iraq's oil operations . . . Iraq is divided into three parts, each explored by a separate, but associated, oil company.

Ownership of these companies is shared by American, British, and French interests with the British interest the greatest.

The three companies are Iraq Petroleum, which operates the big Kirkuk field producing 463,000 bbl. daily in the northeastern part of the country bordering on Iran; Mosul Petroleum, which produces slightly less than 25,000 bbl. daily from small fields in extreme northern Iraq; and Basrah Petroleum which produces 216,000 bbl. daily from the newer Rumaila and Zubair fields just north of Kuwait in southern Iraq.

Ownership of the three companies breaks down this way: Royal Dutch-Shell, 23.75%; British Petroleum Co., 23.75%; Cie. Francaise des Petroles, 23.75%; Near East Development Co. (owned jointly by Jersey Standard and Socony Mobil), 23.75%; and the C. S. Gulbenkian estate (Mr. Five Per Cent), the remaining 5%.

All three of the operating companies in Iraq carry on active oil exploration programs, but the most successful has been Basrah's effort in southern Iran.

Iraq has long prodded the companies to increase the country's oil output—and its own revenue—but the limiting factor on boosting southern production has been the port of Fao. Located at the head of the Persian Gulf, Fao is a shallow-draft port and can handle only smaller tankers because of a bar at the mouth of the Shatt-Al-Arab.

Basrah Petroleum announced just a week ago plans for a $45-million deep-water loading terminal in the waters of the Persian Gulf. To be located about 20 miles south of Fao, plans call for a steel-pile structure with two 400-ft. long berths to accommodate the biggest tankers afloat.

The new loading port was scheduled for completion by the end of 1960.

New government demands . . . The oil concession in Iraq has another 52 years to run.

The concession was granted to the old Turkish Petroleum Co. March 14, 1925, for a period of 75 years. The over-all name of the enterprise was changed to Iraq Petroleum Co. in 1929, and the operations divided between the three companies that now operate there.

The Iraq Government has prodded the companies for years to boost oil production, but it has been only in the last few months that pressure has become intense to "give Iraq a better deal."

Most of the agitation has been prompted by new Middle East concessions on terms regarded as "better" than the traditional 50-50 profit split which was established in Iraq in 1951. At that time companies agreed to renegotiate the terms if another Middle Eastern country received a better profit split.

This part of the agreement, however, hinges on another country actually receiving a bigger share of oil profits. The Italians, Standard Oil of Indiana, and a Canadian company have entered deals in Iran based on what has been called a 75-25 split, but none of the three has yet found or produced any oil or profit. None is likely to produce any oil for months to come.

The same thing is true of the 56-44 profit split which the Japanese offered Saudi Arabia and the 57-43 deal offered Kuwait for Neutral Zone offshore concessions.

Ironically, H. H. Herridge, managing director of IPC was in Baghdad talking with Iraq officials when the revolt flared.

Ministers in the now ousted government have made no secret of the fact they would insist on some revision of the present concession agreement. Prime Minister Nuries Said, strong man killed by the insurgents, has been credited with keeping the more volatile ministers in his government under control in their demands to IPC.

It has been apparent in recent reports from both Europe and Baghdad that Herridge was being asked to relinquish some of the concession area so it could be offered other companies.

An underlying threat of nationalization of Iraq's oil has been talked as an alternative if IPC did not take some action to satisfy the Iraqis.

One Iraqi minister said only last week that his country has been approached by companies from Russia, Canada, Italy, and Japan for a part of what is now controlled by IPC. The minister said Iraq was ham-

pered in its dealings with IPC because of what he admittedly called the inability of the government to play one company against another.

Congress reacts . . . Washington officials were concerned about Iraq's oil. But their main worries centered around the military and political potentialities of the revolution.

The overthrow of Faisal's government touched off bitter criticism of the administration's foreign policies, in the course of which Sen. Joseph C. O'Mahoney (D-Wyo.) suggested that they may have been influenced by oil interests.

Expressing the hope that this was not so, Sen. Hubert H. Humphrey (D-Minn.) nevertheless declared "we should be fully aware of those interests."

Humphrey, who voiced sharp criticism of the administration's policies, pointed out a number of problems which he said should be solved quickly in the interests of Middle East peace.

There is need, he said, for a settlement in regard to the Suez Canal and an understanding about international waterways, such as the Gulf of Aqaba and the Straits of Tiran.

Equally needed, he suggested, is an oil pipeline from Iran to Turkey, suggested to the United Nations 2 years ago.

Changes coming . . . If the flames in Iraq spread and ultranationalists take over, Europe may be in for another "Suez crisis."

Oil men in Washington last week speculated about the results of such a situation.

The U. S. industry might again be called on to set up a European oil lift. It undoubtedly would comply, they said. But oil companies harassed by congressional investigations and antitrust actions following the Suez crisis are sure to demand firm assurance against another such aftermath before taking on the job.

Even if the present crisis blows over without any hurt to oil supplies, observers see long-range possibilities of demands for changes in the agreements under which foreign companies operate in Middle East nations falling under Nasser's influence.

Government studies, made as insurance against any eventuality, are said to show that sufficient oil could be provided by the U. S. and Venezuela, with possibly some contribution by Canada, to meet Europe's needs for a time at least.

There also is sufficient tanker tonnage laid up to carry the oil to Europe.

How Middle East Oil Is Divided

Country—	April crude production (1,000 bbl.)	Per cent total free-world output	Reserves 1957 (1,000 bbl.)	Per cent of free-world reserves	Per cent reserves controlled by U. S.
Iraq (IPC)	633	4.3	25,000	10.5	23¾
Bahrain	40	0.3	200	0.1	100
Iran (Consortium)	843	5.7	32,000	13.5	40
Kuwait	1,398	9.4	60,000	25.2	50
Qatar	187	1.2	1,750	0.7	23¾
Neutral Zone	70	0.5	5,000	2.1	100
Saudi Arabia	928	6.3	45,000	18.9	100
Total*	4,099	27.7	168,950	71.0	58.8

*Not included are minor operations in Israel, National Iranian Oil Co. output, or British Petroleum operations at Naft Khanem in Iraq.

Iraq Has Been Building With Oil Money

IRAQ, once the storied cradle of civilization, has used oil as the key to success in its 700-year struggle to regain the stature it once had as ancient Mesopotamia.

The sixth largest oil producer in the world today, Iraq has something which no other Middle East country has—water. Iraq's water may be as valuable to it as its oil, but oil is financing the country's comeback in the world of nations.

Iraq thrived for centuries on two mighty rivers, the Tigris and the Euphrates. These two rivers formed ancient history's "cradle of civilization." The rivers meet south of Baghdad, both the ancient and modern capital of the country, and form the Shatt-Al-Arab which empties into the head of the Persian Gulf.

Until 6 years ago Iraq had not even begun to recover from the hordes of Mongol invaders that swept out of Asia and covered the country more than 7 centuries ago.

The Mongols destroyed the irrigation system, fed by the two rivers, which made the country a fertile food producer. With the irrigation system gone, Iraq went back to desert and has never been the same.

Today the country has less than 5 million people. Only about 12% of its 171,600 sq. miles of land (bigger than California) is in cultivation.

Wise investment . . . Under what is easily the most enlightened program in all the Middle East, Iraq has been using its oil money to build the country.

Since 1951, when Iraq negotiated its 50-50 profit split formula with Iraq Petroleum Co., Ltd., and associated companies, Mosul Petroleum Co. and Basrah Petroleum Co., 70% of its oil income has gone into development projects.

The Iraq Development Board, a statuatory nonpolitical board formed in 1950, oversees the spending of the money and initiates major projects in addition to financing those started by various ministries of the government.

Since 1951 when Iraq's oil revenue was $38.9 million the yearly share to the government has risen to $132.6 million last year. The 1957 figure was not the peak because Iraq's oil income dropped sharply when its pipeline system was sabotaged in Syria after the British-French-Israeli invasion of Egypt took place at the time of the closing of the Suez Canal.

Since 1951, Iraq's oil income has totalled $1,042,160,000.

Political background . . . Politically the Hashemite regime in Iraq is synthetic.

The great grandfather of Faisal II, the 23-year-old monarch who apparently was killed last week, was Hussein, sherif of the holy city of Mecca in Arabia. The family was driven out of the country by the father of the present king of Saudi Arabia.

Faisal's father and uncles led the Arab revolt against the Ottoman Empire during World War I. and in appreciation for their efforts the British installed the Hashemite family as monarchs, in both Iraq and what is now Jordan.

Faisal, Iraq's slain king, and Hussein, the present king of Jordan, are cousins.

Core Boat Record: 139 Work Months, 446 Holes

	Boat A	Boat B	Boat C	Boat D	Boat E	Boat F	Boat G	Boat H	Boat I
Months of operation	16	16	19	15	13	26	7	12	15
Number of holes drilled	60	50	75	50	40	87	15	*7	62
Average depth, ft.	3,600	2,400	2,340	2,630	2,570	3,450	2,000	4,960	3,200
Deepest hole, ft.	6,530	4,120	4,008	4,180	4,200	6,485	2,120	6,500	6,300
Deepest water drilled in, ft.	356	360	320	380	340	345	255	240	245
Average water depth, ft.	172	177	183	168	175	166	200	225	150
Conductor pipe, diameter, in.	10¾	10¾	10¾	10¾	10¾	10¾	10¾	10¾	7-9⅝
Conductor pipe, avg. length, ft.	110	65	73	82	55	90	110	100	150
Second string, diameter, in.	7	7	7	7	7	7	7	8⅝	7
Second string, length, ft.	450	310	290	340	245	410	490	610	450-1,200
Hole below casing, diameter, in.	6⅛	6⅛	6⅛	6⅛	6⅛	6⅛	6⅛	7⅞	6⅛
Cost per foot	$13.00	$14.50	$12.40	$15.50	$16.20	$12.20	(?)	(?)	$11.00 up
Initial cost of boat ($1,000)	$1,450	$375	$322	$390	$345	$1,670	(?)	(?)	$750

*36 days on one hole, 115 days on another. One hole cased to below 6,000 ft.

Offshore Drilling Boats Prove Value

FLOATING drilling barges have been established as valuable exploratory tools in evaluating oil prospects in California coastal waters.

It is impossible to determine just what role they played in the record cash bonus bids for five parcels off Santa Barbara, but it apparently was a big one.

Results of the tests have been closely guarded secrets. But the size of the bonus bids ($55.5 million) indicates the success of the core drilling (OGJ, July 7, p. 72).

Another development which makes the offshore parcels look good is the completion of an indicated gas-field discovery just 3,000 ft. inland from shoreline of Santa Barbara County.

Richfield's success . . . One example of the effectiveness of the floating barges is their use by Richfield Oil Corp. on its 1,170-acre lease offshore from Rincon.

After being awarded the parcel, Richfield used its "Rincon" and "La Ciencia" to drill six core holes. One was carried to 4,100 ft. and a 6-hour production test run.

The hole later was pumped full of cement and abandoned. But on the basis of the core tests, Richfield located an expensive earth-filled island — now nearing completion — from which it will develop the lease.

The record . . . A total of 446 holes in stratigraphic or core holes have been drilled in the last 3 years by California operators. They used nine floating drill barges, either company-owned or operated under contract.

Of the nine barges, Richfield has two. Union Oil Co. (as operator for the CUSS group), Standard of California, and General Petroleum Corp. each has one. The others were operated under contract by Submarex Corp., Santa Barbara.

Can go deep . . . Figures compiled by Shaffer Tool Works, Brea, Calif., show the average depth of the 446 holes drilled was 2,930 ft. In several cases, holes were drilled to 6,500 ft. from the larger barges.

Most of the barges have been operating for a year or more. One has drilled 87 holes while most have drilled 50 or more tests.

Deepest water depths the barges operated were in excess of 350 ft. Average water depths involved ran 179 ft.

In the all important costs category, per foot costs varied among the barges from a low of $11 to $16.20 per foot.

Operators of the CUSS 1, the largest vessel in the core boat fleet, recently stated exploratory drilling and testing core drilling or stratigraphic drilling programs in several hundred feet of water could be conducted at costs comparable to similar onshore programs.

Costs of the vessels ranged from a low of $322,000 in the smaller barges to $1,670,000 in the most expensive barges. Two gave no cost report.

It is estimated at least one of the big barges in the California fleet—its price tag not included in the Shaffer Tool survey—cost around $3 million.

Phosphorous Additive Combats "Rumble"

CITIES SERVICE CO. is attacking the "rumble" problem in motor fuels by including a phosporous additive in its premium gasolines.

The company says the new formulation will be introduced initially in its 100-Plus and Super 5-D gasolines in the New York metropolitan area and will be available throughout its 38-state marketing territory by late summer.

The "rumble" of high compression engines is caused by the abnormal combustion of motor fuels accompanied by an accelerated rise in pressure. This fast rise causes low frequency structural vibrations within the engines heard as a "rumble."

Generally speaking a high paraffinic content in a motor fuel will mean little or no "rumble." As aromatic content increases so does the noise, and volatile olefin components prove to be the worst offenders (OGJ, June 16, p. 62).

With modern motor fuels containing high amounts of aromatics, the "rumble" problem has become increasingly prevalent. Octane increases alone are not enough to cure the ill.

Phosphorous additives do have a marked effect in decreasing rumble; hence the Cities Service move. Slight changes have been made in the blending of its premium fuels, but the substantial improvement in solving the "rumble" problem has been the additive.

Import Clause Written

. . . by Senate finance committee to include finished products. Trade law to be extended 3 years instead of 5.

A FOREIGN trade bill carrying an involved national security clause and limited to less than the 5 years asked by the administration will go shortly to a Senate-House conference committee for final writing.

If other features unacceptable to the President are kept out of the measure, the revamped Section 7 will set a new pattern for control of imports. The controls will include finished products as well as crude and unfinished oils.

Commerce Sec. Sinclair Weeks said additions made by the Senate finance committee will make the import control provision unworkable.

But other officials concerned with the problem say it raises no difficulties. The cabinet fuels committee in the past has considered all the factors now set forth as part of the basis for setting quotas.

Domestic producers take still a third view.

The new clause "does give greater authority and stronger direction to the President to control imports," declared Russell B. Brown, general counsel of the Independent Petroleum Association of America.

Domestic interests are disappointed over their failure to win adoption of the Ikard plan imposing mandatory quotas. But they are expected to accept the new provision, unless it is shown to be no more effective than present controls.

Groundwork for extension of controls to product imports already is being laid by Capt. M. V. Carson, Jr., import administrator.

Long-range plan . . . The bill sent to the Senate floor by the finance committee called for only a 3-year extension of the reciprocal trade law.

But the committee indicated a desire to end the periodic fights over imports which have marked the 11 extensions of the law since it was adopted in 1934.

The bill would set up a nine-member commission to study U. S. foreign trade policy and file a report by June 30, 1960. On the basis of this, a permanent trade law would be enacted.

The committee had no difficulty agreeing to enlarge the national security clause.

It rejected an amendment by Sen. Russell B. Long (D-La.) setting up import quotas for oil and auctioning import certificates to high bidders.

Long said he would again offer his plan when the bill comes up on the floor. But there was little indication that he could round up enough votes to put it into the measure.

Products . . . Carson's first step in studying product controls will be to ask importers for data on their current and future plans. Officials pointed out that this is in line with the cabinet committee's instructions that product imports be kept under review.

The new language in the foreign trade bill is not needed to authorize the President to order controls on finished products, they said.

The bill was scheduled to come up for debate in the Senate late last week. There were no predictions as to how much time would be needed to pass it, particularly in view of the situation created by another committee amendment stripping the President of his authority to reject Tariff Commission findings without congressional approval.

Once cleared by the Senate, the bill goes to a conference committee of the two houses for final drafting.

Text of the New Security Clause

"Upon request of the head of any Department or Agency, upon application of an interested party, or upon his own motion, the Director of the Office of Defense Mobilization (hereinafter in this section referred to as the "Director") shall immediately make an appropriate investigation, in the course of which he shall seek information and advice from other appropriate Departments and agencies to determine the effects on the national security of imports of the article which is the subject of such request, application, or motion.

"If, as a result of such investigation, the Director is of the opinion that the said article is being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security, he shall promptly so advise the President, and, unless the President determines that the article is not being imported into the United States in such quantities or under such circumstances as to threaten to impair the national security, as set forth in this section, he shall take such action, and for such time, as he deems necessary to adjust the imports of such article and its derivatives so that such imports will not so threaten to impair the national security.

"For the purposes of this section, the Director and the President shall, in the light of the requirements of national security and without excluding other relevant factors, give consideration to domestic production needed for projected national defense requirements, the capacity of domestic industries to meet such requirements, existing and anticipated availabilities of the human resources, products, raw materials, and other supplies and services essential to the national defense, the requirements of growth of such industries and such supplies and services including the investment, exploration, and development necessary to assure such growth and the importation of goods in terms of their quantities, availabilities, character, and use as those affect such industries and the capacity of the United States to meet national security requirement.

"In the administration of this section, the Director and the President shall further recognize the close relation of the economic welfare of the Nation to our national security; and shall take into consideration the impact of foreign competition on the economic welfare of individual domestic industries; and any unemployment, decrease in revenues of government, loss of skills or investment, or other serious effects resulting from the displacement of any domestic products by excessive imports shall be considered, without excluding other factors, in determining whether such weakening of our internal economy may impair the national security."

More Cuts Posted

in Texas, Rockies. Some oil fields in Canada get boost.

MINOR PRICE changes involving increases for some Canadian crude and reductions for U. S. crude in Texas and the Rockies were posted last week by buyers.

Imperial Oil, Ltd., posted increases for two Alberta fields and cut in one. The flat price for Big Lake South oil was cut 10 cents to $2.35 a barrel, while a 3-cent increase to $2.61 was posted for Golden Spike and a 2-cent increase to $2.41 was made on Innisfail D-3.

Great Northern Oil Purchasing Co. increased prices 5 cents a barrel for 10 southwestern Saskatchewan fields. New postings were $1.67 per barrel in Dolard, Midway-Premier, Gull Lake, Instow, and Bone Creek fields and $1.69½ in Fosterton, Cantaur, Success, South Success, and Batrum fields.

In the U. S., Continenal Oil Co. cut its posted prices for Southwest Texas crude by 15 cents a barrel. New schedule tops at $3.20 for Cameron, Hidalgo, and Starr counties.

Indiana Oil Purchasing Co. announced a 10-cent cut for parts of Colorado, Nebraska, and Wyoming with a new top of $2.98. The Indiana cut met similar action taken earlier by Pure Oil Co. and Sinclair Crude Oil Purchasing Co.

PRODUCTS LINE had to conquer rocky, timbered Osage Hills before . . .

New Cherokee Line Completed

CHEROKEE Pipe Line Co. has completed the first stage of its products-line expansion which will enlarge outlets in the Midwest market to Oklahoma refiners.

Crews of Pipeline Service Co., Seminole, have finished laying 87 miles of 12-in. between Ponca City and Glenn Pool station, near Tulsa.

This gave the refineries of The Texas Co. and D-X Sunray Oil Co. connections at Tulsa. At Ponca City, Continental Oil Co. and Cities Service Oil Co. refineries already had connections. The line runs from Ponca City to Wood River, Ill.

Two final stages of the project will be completed by September 1. They include conversion of the second of the two 400-mile, 10-in. lines from Glenn Pool to Wood River, and a station-expansion program. Buttram Pipe Line Construction Co. has the conversion job.

This will give the Continental-Cities Service-owned Cherokee line daily delivery capacity of 60,000 bbl. through the 12-in. line from Ponca City to Glenn Pool and the two 10-in. lines to Wood River. Expansion to 90,000 bbl. daily is possible.

Cherokee also soon will get a direct tie-in with the big Chicago market. At Wood River, Cherokee will connect with the new Wabash Pipe Line, owned by Continental and Ohio Oil Co. Wabash this month started on a 250-mile, 12-in. line to Chicago from Wood River.

Station expansion . . . Three new stations, designed for unattended operation, will be constructed on the Glenn Pool-Wood River line.

They will be at Afton, Okla., 1,300 hp.; Richland, Mo., 500 hp.; and Belle, Mo., 1,200 hp. At existing stations, 700 hp. will be added at Ponca City, 600 hp. at Glenn Pool, and 600 hp. at Mount Vernon, Mo.

A 200-hp. station was built at the D-X refinery and a 400-hp. station at the Texaco refinery. All station pumping equipment will be electric-driven centrifugal pumps.

Construction . . . Construction was begun April 1 starting at Glenn Pool.

Some 3½ miles of the congested West Tulsa industrial district was the most tedious and time-consuming part of the project. Nine days were required to connect the Texaco refinery, where almost 200 other pipelines had to be crossed. Hand tools were used almost exclusively.

Tbe contractor worked for 25 days on boring under the Frisco Railroad yard, which was 739 ft. wide. Pipe through the industrial area was yard coated. Coating was subcontracted to Secrest Pipe Coating Co., Tulsa, and road crossings to Oklahoma Road Boring, Inc.

M-R Co., Wichita, installed the two major crossings of the Arkansas River at West Tulsa and Ponca City.

Rock was encountered over much of the route, ranging from sandstone in the Osage Hills to limestone in open country. Several rattlesnakes and copperheads, disturbed by blasting, were killed by the powder gang.

PROCESSING

Pioneer Gathering System, Inc., will build a carbon dioxide removal plant on its main transmission line 20 miles northwest of Sonora, Tex. The new plant, with capacity of 12,000 M.c.f. of sour gas daily, will remove carbon dioxide and hydrogen sulfide gases from natural gas sold to Permian Basin Pipeline Co.

The gas is produced in Clayton Ranch, Addie, and Vinegarone fields. Baird & Co., Tulsa, is contractor. Work will start in mid-August with completion expected by December 1. A dehydration plant will also be built at the site. Both plants will be designed for automatic operation.

Ashland Oil & Refining Co. has expanded its solvents and chemicals distribution facilities by acquiring the Ohio division of Anderson-Prichard Oil Corp. The purchase includes plants engaged in solvents and chemicals distribution in Cincinnati, Dayton, Cleveland, Akron, Columbus, and Bellaire, Ohio, and Indianapolis, Ind. Anderson - Prichard's division manager, Homer Easterday, will remain as manager of the distribution plants for Ashland.

Shell Oil Co. of Canada has placed on stream an HF alkylation unit at its Montreal East refinery to produce synthetic dodecyl benzene, a prime base for synthetic detergents. The unit also has facilities to produce motor alkylate. Refinery Engineering, Ltd., of Toronto did the engineering and construction.

Leonard Refineries, Inc., Alma, Michigan, has introduced two new "multipurpose" gasolines in Michigan. The gasolines, designed for outboard boat motors as well as automobile and marine engines, went on the market under the brand names X-tane A&M and Super X-tane A&M.

Rig-Owners' Census

. . . shows no major changes. Total number of contractors is down 32, with most of the loss among small firms.

THE Oil and Gas Journal's 1958 census of drilling contractors discloses no sharp changes in the nature of the contracting business since last year, except to confirm that drilling itself is down.

Two medium-sized contractors moved into the 20-rig class, bringing the number of "big" contractors to 14, but there was considerable attrition among contractors with five or fewer rigs.

The census, taken annually since 1950, is a compilation of statistics furnished by all drilling contractors in the business.

Statistics were compiled separately for the U. S. and Canada.

What they show . . . The census disclosed that in the U. S.:

. . . The number of contractors dropped from 1,219 to 1,187, a loss of 32 from a year ago.

. . . The number of rotary rigs owned rose from 3,937 to 3,981, a gain of 44 over last year. But the number actually in operation dropped from 2,832 to 2,126, a loss of 706.

. . . The number of employes dropped from 64,605 to 62,908, down 1,497.

Size of the contractors remained pretty much the same.

There are now 673 contractors who own one or two rigs, 22 fewer than a year ago. There are 361 who own 3 to 5 rigs, down 12 from last year. And there are 100 contractors this year owning 6 to 9 rigs, one less than last year.

Companies owning 10 to 19 rigs number 39, one more than last year, while those owning 20 or more increased from 12 to 14.

Since The Journal started taking the census in 1950, there have been no marked changes in ownership trends. For example, there are only two more companies today owning 20 or more rigs than there were in 1951.

The census is confined to drilling contractors and does not reflect the number of drilling rigs owned by producers.

Canadian picture . . . The sag in drilling activity is more pronounced in Canada than in the U. S.

The number of contractors increased from 77 to 82 and the number of rigs from 326 to 333—but the number of rigs actually operating fell drastically from 290 to 147, almost 50%.

Employment was more stable. The total number of employes was virtually the same—6,016 this year against 6,017 last year.

Copies of the census report may be obtained by a postcard request to: Industry Census Department, The Oil and Gas Journal, Box 1260, Tulsa, Okla.

How U. S. Rigs Are Owned

Rigs owned:	No. contractors	Rigs owned by group	% total rigs owned
Over 20	14	501	12.58
10 to 19	39	498	12.51
6 to 9	100	682	17.13
3 to 5	361	1,335	33.53
1 or 2	673	965	24.25

Home Offices . . . in the U. S.

City—	Contractors	Rigs
Bakersfield, Calif.	24	61
Los Angeles-Long Beach	34	198
Denver	38	132
Midland-Odessa	62	259
Wichita, Kans.	51	126
Oklahoma City	48	139
Tulsa	65	513
Wichita Falls, Tex.	76	230
Fort Worth-Dallas	68	285
Shreveport	33	147
San Antonio	27	65
Houston	70	301
Corpus Christi	19	54
Abilene, Tex.	32	89
Others	540	1,382

. . . and in Canada

City—	Contractors	Rigs
Calgary	49	262
Edmonton	14	48
Others	9	23

BRIEFS . . .

Four new units have gone on stream at the 16,500-bbl. Wynnewood, Okla., refinery of Kerr-McGee Oil Industries, Inc. Included are a 7,350-bbl. naphtha prefractionator, a 5,500-bbl. naphtha Unifiner, a 5,500-bbl. Platformer, and a 4,000-bbl. middle distillate Unifiner. The units were designed and built by Refinery Engineering Co. of Tulsa.

An ethylene oxide-glycol plant will be designed by Scientific Design Co., Inc., for Mitsubishi Petrochemical Co., Ltd., Yokkaichi. The plant will be the second in Japan using the SD direct air oxidation process. It will double Japanese ethylene oxide production.

Construction of ethylene and poly-ethylene plants at La Plata, near Buenos Aires, may be the outcome of a new contract between Industrias Plasticas Argentinas Koppers, S.A., and Yacimiento Petroliferos Fiscales. The former is a partially owned subsidiary of Koppers Co., Inc., Pittsburgh, and YPF is Argentina's state-owned oil company.

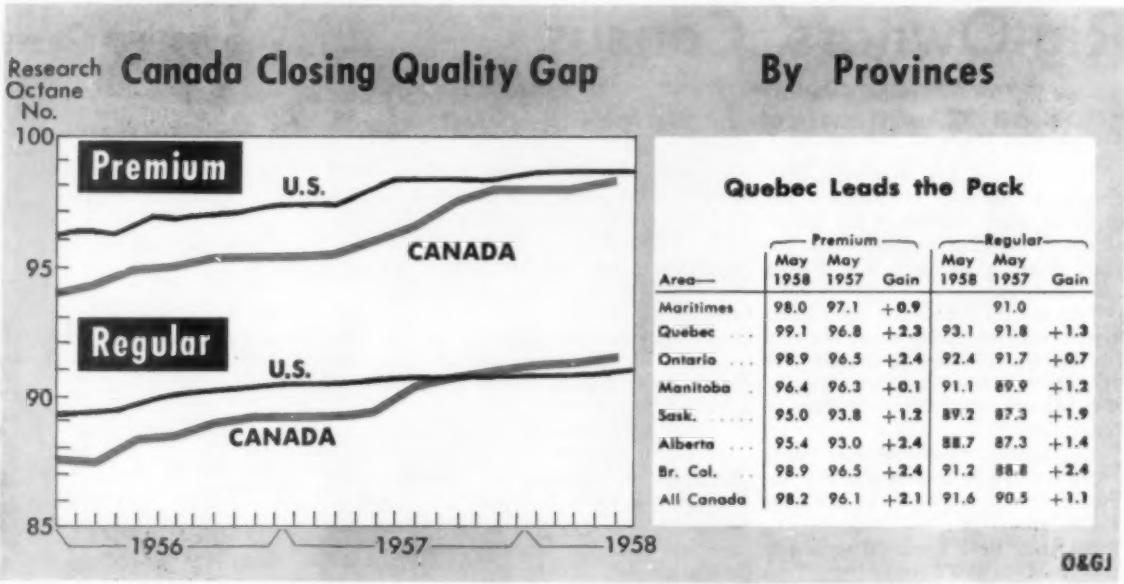
Koppers said construction of the new plants depends on licensing and other approvals by Argentina and the raising of capital. A large portion of the capital is expected to come from within Argentina. The plants would use gas from nearby YPF refineries.

A 6,500-bbl. Hydrofiner and a sul-furic acid recovery plant will open next year at the 35,000-bbl. Porto Marghera refinery of IROM near Venice. British Petroleum Co. and Azienda Generale Italiana Petroli are joint owners.

Also for Refiners . . .

IN THE NEWS: Canadian refiners pushing U. S. for supremacy in the octane race (p. 54) . . . Captain Carson defines unfinished gasoline and other products and extends control program to all unfinished oils (p. 57) . . . Socony Mobil is setting up world-wide computer link for refinery control (p. 62) . . .

PLUS THESE TECHNICAL REPORTS: Longer life for MEA reboilers (p. 82) . . . Corrosion problems in light-hydrocarbon liquids plants (p. 93) . . . Plastic repair may solve leak problems (p. 97).


Research Octane No.
Canada Closing Quality Gap
By Provinces
100
95
90
85
Premium
U.S.
CANADA
Regular
U.S.
CANADA
1956
1957
1958
Quebec Leads the Pack
Premium
Regular
Area— | May 1958 | May 1957 | Gain | May 1958 | May 1957 | Gain
Maritimes | 98.0 | 97.1 | +0.9 | | 91.0 |
Quebec | 99.1 | 96.8 | +2.3 | 93.1 | 91.8 | +1.3
Ontario | 98.9 | 96.5 | +2.4 | 92.4 | 91.7 | +0.7
Manitoba | 96.4 | 96.3 | +0.1 | 91.1 | 89.9 | +1.2
Sask. | 95.0 | 93.8 | +1.2 | 89.2 | 87.3 | +1.9
Alberta | 95.4 | 93.0 | +2.4 | 88.7 | 87.3 | +1.4
Br. Col. | 98.9 | 96.5 | +2.4 | 91.2 | 88.8 | +2.4
All Canada | 98.2 | 96.1 | +2.1 | 91.6 | 90.5 | +1.1
O&GJ

Canada Threatens U. S. Octane Lead

CANADA'S STEADILY climbing octanes are posing a real threat to U. S. supremacy in the field of gasoline quality.

A comparison of Ethyl Corp. surveys of motor-fuel quality in the two countries reveals that the average Canadian regular grade now has a higher octane value than U. S. regular, and Canadian premium is only a shade behind U. S. premium.

Ethyl Corp. surveys gasoline quality in the U. S. monthly and in Canada every other month. The last comparable month was May. At that time U. S. premium averaged 98.5 RON against Canada's 98.2 and U. S. regular, 91.2 RON against Canada's 91.6.

Since regular outsells premium, this means that on a pool basis Canadian motor fuel quality is higher than that in the U. S.

Lead changing? . . . This is a real switch in the historic relationship between U. S. and Canadian gasoline.

U. S. quality has always been appreciably higher. As recently as 2 years ago it was two numbers higher in premium and one and a half in regular (chart).

The switch that put Canadian regular ahead of U. S. and brought its premium almost to a par began last summer. At that time U. S. regular was still an octane and premium two octanes ahead of Canada. Since then, however, both U. S. grades have remained rather static while their north-of-the-border counterparts kept moving ahead.

Since May of last year, U. S. premium has gone from an average of 98.0 RON to 98.5, an increase of half an octane. In Canada, premium went from 96.1 RON to 98.2, an increase of 2.1 octanes, four times the U. S. numerical advance. At the same time U. S. regular went from an average of 90.8 RON to 91.2, a 0.4 increase, while Canadian regular went from 89.8 RON to 91.6, a 1.8 increase, four and a half times the U. S. numerical gain.

The chart shows that Canadian regular went above U. S. regular in September of last year. Since then it has been steadily widening the margin. Furthermore, if Canadian premium goes up as much this month as it did in May and U. S. premium continues to hold, the two will be on a par.

Only one company has gone into the more than two-grade system in Canada so far. However, it happens to be Sun Oil Co. which is selling the highest octane "superpremium" in the states and is following the same practice in Canada. Just last month Sun completed the installation of its six-grade pumps in 750 stations in Ontario and Quebec, the only provinces in which it markets. These grades range from Blue Sunoco 200 at 94 octane to Blue Sunoco 260 at more than 102 octane.

Quebec has best . . . Quebec, with Canada's heaviest concentration of refining, sells the best gasoline, on the average, in the country.

The Ethyl report for May showed Quebec's premium average at 99.1 and regular at 93.1. Its premium equaled that sold in metropolitan New York, usually the U. S. "hot" spot, and its regular was one-tenth higher. Ontario and British Columbia, both at 98.9 in May, were close behind Quebec.

While Quebec topped all other provinces in quality, it did not top all others in rate of increase. Ontario, Alberta, and British Columbia all jumped 2.4 numbers in premium since last year, while Quebec went up 2.3.

Venue Ruling Set

for September 10 in price-fix case against oil firms.

A DECISION on whether 29 oil companies facing price-fixing charges will be tried in Tulsa or Alexandria, Va., will not be made for nearly 2 months.

Federal Judge Albert V. Bryan of the Alexandria District Court has set September 10 as the date for argument on the companies' motion to shift the case to Tulsa.

The government will oppose the motion. Since the Justice Department's case will depend largely on documents already in its possession, Alexandria would be more convenient.

Some observers believe the motion will be denied. They point out that Judge Bryan is a member of a judicial council committee scanning methods of speeding up cases. He might feel

that by keeping the suit in his court he could demonstrate what can be done to expedite justice.

When the motion for change of venue was submitted at a hearing this month, (OGJ, July 14, p. 81), Judge Bryan indicated he wanted to hurry the case along. He left no doubt that if he keeps the case he will demand that both the government and the companies cooperate to wind it up as quickly as possible.

Expansion Started

by Southern Natural with pipeline contract awards.

SOUTHERN NATURAL Gas Co. has awarded contracts for 484 miles of pipeline in a program to increase capacity of its Louisiana-Alabama system by 298,030,000 cu. ft. daily.

Bids were being opened last week on additional construction in the South Louisiana marshland, where new fields are being connected.

Successful bidders were:

. . . **Williams Brothers,** 42 miles of 24-in. from Lake Pontchartrain to Franklinton, La.

. . . **River Construction Corp.,** 67 miles of 26-in. from Franklinton to Gwinville, Miss., and 56½ miles of 24-in. from Gwinville to Enterprise.

. . . **Houston-Price-Latex,** 62.8 miles of 24-in., 56.9 miles of 24-in., 46½ miles of 24-in., and 46½ miles of 20-in. in various sections on the South line system, plus 40.1 miles of 14-in. on the Atlanta line and 23 miles of 14-in. on the Rome, Ga., line.

. . . **Ford-Bacon & Davis, Inc.,** 18 miles of 8-in. at LaGrange, Ga., and Calera, Ark., 5 miles of 12-in. near Amory, Miss., 8 miles of 20-in. between Gwinville and Pickens, Miss., and 12 miles of 6-in. on the Vicksburg, Miss., line.

Southern Natural has received certificates to connect reserves estimated at 1,042,533,000,000 cu. ft. The proposed initial price of 22.8 cents an M.c.f., subject to Federal Power Commission investigation as to its reasonableness, is among the highest ever paid in South Louisiana.

That price does not include the additional 1-cent per M.c.f. gathering tax to become effective in Louisiana August 1 (OGJ, June 16, p. 80).

Producers who will supply the gas are Tidewater Oil Co., The California Co., Aluminum Co. of America, Howell & Howell, Dallas, Sohio Petroleum Co., Shell Oil Co., Continental Oil Co., John W. Mecom, Lyons & Logan, Shreveport, C. G. Glascock-Tidelands Oil Co., et al., Corpus Christi, and Berkshire Oil Co. and R. R. Frankel, Houston.

watching WASHINGTON

Bertram F. Linz

• "Natural" rubber faces competition

DON'T EXPECT to buy any synthetic "natural" rubber within the next 2 or 3 years.

This latest baby of the rubber industry—a synthetic that actually has all the properties of natural rubber—isn't expected to come on the market before 1960. One company may have a 30,000-ton plant in operation by then, but high-volume production may be a long way off.

The reason for what seems to be a lack of interest by rubber makers is simple. The synthetic is as good as natural—but no better. So it will have to compete on a price basis. And Far East rubber growers are getting their costs down. Nobody is willing to predict what the price of natural rubber will be a month hence, let alone 2 years.

This new rubber is considered highly important, however. It means that never again can this country be caught in the jam it was in when the Far Eastern rubber supply line was cut by the Japanese in the early days of World War II.

The Government now is carrying a rubber stockpile of around 1,250,000 tons. Once the new synthetic natural is established, it can cross rubber off the list of strategic materials to be hoarded.

• Canada wrestles with gas-export problem

CANADA'S Borden commission is facing a tough problem.

The group was set up to study and lay out a national energy policy. It will decide, among other things, whether large-scale export of Canadian gas to the U. S. should be allowed.

There is much pressure for the export of gas to U. S. pipelines. But there also are warnings against the sale at today's prices of an irreplaceable resource that will be much more valuable in the future.

The commission is due to make an interim report shortly. But its final report may not come for another 2 years.

Any action on the export of gas on the basis of the interim report would tie the commission to a policy it would have to follow in its final report, even though it then might seem less desirable.

Canada is looking toward a big industrial expansion, based on the new St. Lawrence Seaway and availability of domestic oil and gas. It isn't happy over U. S. quotas on oil imports. And these are factors the commission will take account of in writing its energy policy.

• Senators tighten security clause

Across-the-board mandatory curbs on oil imports, from crude to finished products, looks like the price Congress will set for a foreign trade bill Eisenhower will feel he can sign.

The administration isn't greatly disturbed over the new criteria written into the national security clause by House and Senate. It argues that all these factors have been weighed in the past by the cabinet fuels committee in setting quotas.

But another change in Section 7, putting the President on the defensive, may be of more importance.

The present law calls for action "if" the President finds imports a threat. The Senate finance committee changed this to require action "unless" the President can find imports are not a menace. And it applies this not only to crude but also to its derivatives.

The bill doesn't call for mandatory curbs. But Congress may ask for assurance that import controls will be enforced before it finally abandons the idea of quotas.

Deliveries Cost Money

. . . for the oil business. A new study shows $2.14 is spent for every $100 of goods delivered. Hand tools cost most.

IF THE OIL industry wants to save money on supplies and equipment, an oil-field supply company can furnish a valuable tip on how to do it.

The tip: don't be so demanding for special services and attention.

The supply house has the figures to support its contention that customer demands add substantially to the cost of doing business and, in the long run, the cost of the supply items themselves.

The company, which chooses to remain anonymous, ran an exhaustive study last November of its delivery functions at the supply store level. It came up with statistics like these:

. . . **The cost of delivering goods** amounted to $2.14 for every $100 worth of goods sold.

. . . **12% of all deliveries** are made at the customer's insistence on special attention.

. . . **13% are made** to gain customer good will.

. . . **32% are made** to build or replace customer stocks.

. . . **41% are made** to fill emergency requirements.

What was included . . . In the month-long study, the supply company considered only separate trips made for deliveries—not the regular deliveries of salesmen making their usual sales calls. Both the driving mileage and the employe's time were considered.

The company's stores wrote 16,950 orders during the month. To deliver these orders, 12,719 separate trips involving 313,161 miles of driving in company vehicles were necessary. The mileage was about 25% of the total driven by store-based cars and trucks.

Merchandise averaged $149.04 in cost for each delivery, and the average cost per delivery was $3.19.

The study showed that some customers require far more special delivery attention than others. The 12,719 delivery trips were made for 1,739 customers. Only one delivery was made during the month to 742 customers, but 18 customers accounted for more than 100 each.

Types of equipment . . . Hand tools and hardware account for more deliveries than any other type of equipment—and ratio of cost to sales price also is the highest in this category.

The study found that 3,356 deliveries were made of hand tools and hardware, plus another 1,562 deliveries in combination with other products. Considering only the 3,356 deliveries, this accounts for 26.4% of the total.

The value of this merchandise, however, came to only 10.4% of the total. This ran the ratio of delivery cost to sale price up to 3.8%, well above other categories.

Down-well pumps and wellhead equipment were responsible for 23.1% of the deliveries, but, because of their larger value, the cost-sale ratio was only 1.92%.

Engine and machinery parts accounted for 11.3% of the deliveries. Cost-sale ratio was 2.45%.

The company found that 54.7% of the deliveries were for production, 37.2% for drilling, and 8.1% for other purposes, such as refineries, pipeline companies, and other industry.

Partly because of the greater distances to be traveled, the company found that deliveries in the northwestern states and western Canada were more costly than those in other states. Also the Gulf Coast of Louisiana and Texas is a high-cost area.

LPG Spurs Bisti Production

. . . at Sunray project. Early results highly favorable. Expansion could mean 26,000,000 bbl. of new oil.

HOW SUCCESSFUL is New Mexico's first LPG flood at Bisti field in the Four Corners area?

After nearly a year of close watching, engineers are saying that the experiment "looks like a real money-maker." But they cautiously add that more time is needed to make a complete evaluation.

Since the first injection began last August to May 1, the four wells in the 160-acre pilot area have produced 140,000 bbl. of oil. And Sunray Mid-Continent Oil Co., operator of the project, says everything is going as scheduled.

If things continue to go well, miscible-phase displacement at Bisti may nearly double ultimate recovery in the big fie'd where reserves are estimated at 100,000,000 bbl.

Sunray engineers figure 20,000,000 bbl. could be recovered through primary means. Another 10,000,000 bbl. could possibly have been recovered through ordinary gas injection.

This would leave 70,000,000 bbl. in the reluctant Gallup sand. Sunray says the LPG flood can coax up an additional 26,000,000 bbl. These optimistic figures were reported to Sunray employes in a recent issue of the company's magazine, Sunray News.

Here's what happened . . . Sunray drilled one input well in the center of the four-well pilot area. The producers are on a 40-acre pattern.

First injection began last August. A slug of butane was followed by butane and propane, and then propane alone. This was chased by dry gas.

Around the first of the year, the operator reported total injection of about 31,000 bbl. of LPG. At that time, dry gas was being injected at the rate of about 500 M.c.f. daily (OGJ, Jan. 20, p. 89).

Early this year, pressure began increasing in the producing wells, and the rising gas-oil ratio began slackening. Then the producing rate began to climb.

Who's involved . . . Bisti is still a young field, discovered in 1955 by El Paso Natural Gas Co.'s 1 Kelley State.

By starting the LPG flood early in the life of the solution-gas drive field —while bottom-hole pressure is still high—Sunray felt there's a better chance at success (OGJ, July 22, 1957, p. 51).

The big drilling play wasn't kicked off until British-American Oil Producing Co. brought in the 1 Marye in the spring of 1956. Since then, the field has spread to 24,000 acres with 120 wells. About one-sixth of them are owned by Sunray.

The field stretches 15 miles in a northwest-southeast direction and is 1½ miles wide. No plans have been announced yet for expansion of the flood. Engineers say it will be at least 2 months before complete evaluation of the pilot project.

Sunray's partners in the project are British-American and Phillips Petroleum Co. Supporting the experiment are El Paso, Shell Oil Co., and Amerada Petroleum Corp.

A big stumbling block for Bisti in the past was lack of an outlet. Last

year wells were limited to about 14 bbl. production per day. But the picture is changing with completion of the Four Corners crude line to Los Angeles and the Texas-New Mexico Pipe Line Co.'s carrier to Jal in southeastern New Mexico.

The sand at Bisti is a basal member of Mesaverde group of Upper Cretaceous age. Porosity ranges from 5 to 20%, with permeability fluctuating drastically from 374 md. to zero.

Most of the wells were completed flowing 100 to 700 bbl. of oil daily, with average gas-oil ratio of 550:1. No active water drive is indicated.

$100 Million in Oil Land Sale

. . . by Freeport Sulphur to Magnolia in South Louisiana. Deal effective October 1. Mecom keeps interest in area.

MAGNOLIA Petroleum Co. will buy Freeport Sulphur Co.'s interests in Lake Washington gas and oil field in Plaquemines Parish, Louisiana, for $100 million in cash.

The properties comprise interests varying from 10 to 50% in about 58,000 acres, with an average interest of about 35%. Freeport Sulphur's net working allowable interest is about 3,900 bbl. daily out of a total allowable production of 13,500 bbl. daily.

There are 90 oil wells and 6 gas wells in Lake Washington field, which has 25 oil and gas reservoirs ranging in depth from 8,000 to 20,000 ft. The crude is 28°-30° gravity. Six wells are now drilling.

Gas wells are now shut in. But expectations are that Magnolia will be able to sell 15,000,000 cu. ft. daily from the properties it is taking over.

Financial details . . . Magnolia, the southwestern affiliate of Socony Mobil Oil Co., made the best offer when Freeport Sulphur put up the properties for sale. The losing bidders were not identified.

Lanbourne M. Williams, president of Freeport Sulphur, said Magnolia would put up part of the cash itself. The rest will be paid by Chase Manhattan Bank. Chase will be reimbursed by oil payments over a number of years.

The sale is expected to become final by October 1. Closing hinges on a favorable tax ruling and other legal formalities. Freeport Sulphur will pay an expected $26,250,000 in taxes on the deal.

Mecom keeps share . . . John W. Mecom, Houston independent, is retaining his interest in Lake Washington field, where he is the operator. Mecom and Freeport Sulphur jointly discovered the field 6 years ago.

The field lies on the Gulf Coast, 40 miles southwest of New Orleans. Drilling is done from barges. Crude is moved to the Mississippi River by pipeline, from where it is moved north by barge.

Freeport Sulphur entered the oil business in 1948. Its operating division is Freeport Oil Co. Lake Washington field accounted for about two-thirds of the company's 6,000-bbl.-daily output. Other properties are in Texas, Oklahoma, and Kansas.

Unfinished Products Curbed

. . . by new import order. Carson draws line at May-June level. Control of finished products studied.

THE GOVERNMENT'S voluntary import-control program was extended last week to unfinished oils.

Capt. M. V. Carson, Jr., import administrator, announced that unfinished gasoline and other unfinished oil imports will be held to their May-June level.

The control is effective immediately for all unfinished products except those imported for the primary purpose of manufacturing asphalt. Asphaltic residuum will go under control September 16.

Carson disclosed at the same time that serious thought is being given to imports of finished products. All importers are being asked to report their receipts in May and June and their plans for July through November.

The effect of Carson's order is to give all importers of unfinished gasoline and other oils quotas set at the average of their receipts in May and June.

"Unfinished" defined . . . The long-awaited definition of unfinished oils was made public with the quota program.

Government experts had indicated that it was a difficult job to define such products. But they finally managed to get a workable definition boiled down to a 50-word paragraph:

"All gasoline and other petroleum oils, other than crude oil, which are further distilled or processed, including but not limited to cracking, reforming, or treating, for the production of finished petroleum products are unfinished gasoline and other unfinished oils. Petroleum oils, except crude oil, mechanically blended are considered finished oils."

Asphalt . . . A more lengthly definition was required for asphaltic residuum, held to be petroleum residues with a gravity not lighter than 14.9° API and "an asphalt content of not less than 65% of asphalt having a penetration at 25° C. (77° F.) under a load of 100 g. applied for 5 seconds of not more than 100.

"Nothing shall be considered as asphaltic residuum which is processed in a manner which subjects it to destructive distillation, cracking, vis breaking, or hydrogenation," Carson's order said.

"To be considered asphaltic residuum the asphalt derived from the asphaltic residuum must have been or will be sold as paving asphalt, binders, coatings, or waterproofing."

Bacteria May Free Shale Oil

GOVERNMENT SCIENTISTS are endeavoring to put bacteria to work for the budding oil-shale industry.

They're trying to develop a new strain of bacteria which will feed on oil shale and multiply rapidly.

The program is under way at the U. S. Bureau of Mines petroleum and oil shale experiment station in Laramie, Wyo.

The researchers believe it might be possible eventually to use bacteria to produce methane gas, free-flowing oil, and perhaps gasoline from the huge oil-shale beds.

The Laramie experimenters started the project with the knowledge that certain bacteria live in petroleum-bearing sands. Some have even clogged the flow of oil in the sands and retarded production.

So, they reason, it should be possible to develop other strains to make oil flow more freely.

A chemist has isolated seven strains of bacteria which thrive—and multiply—on oil shale. The others have died. But so far none of the seven are completely tolerant of oil shale.

Wildcatters Set Hot Pace in Oklahoma

• Significant discoveries dot the Sooner State in first half of 1958. Exploration influenced by Anadarko basin which provides big gas play in the northwest and deep Ordovician oil hunt in central, south.

OKLAHOMA is far ahead of the field as the nation's hottest wildcatting region for 1958 as the year passes the halfway mark.

Sooner State wildcatters are writing a brilliant story this year. Significant discoveries have come one after another in the northwest, central, south, and southwest sections of the state.

Indications are, too, that geological knowledge and new oil plays turned up by strikes this year will influence strongly the wildcatting and development activity in Oklahoma for several years.

Statistics tell part of the story. Examine a few:

. . . 443 wildcat completions in the first half, up 25% over the same period last year.

. . . 3,217 total completions in same period, up 4.6% over last year.

If the trend of wildcat completions continues the rest of this year, it will give Oklahoma explorers a good year and a definite upturn from last year's performance. Total completions also should top last year, although still lagging behind 1956.

This is happening in spite of a sharp decline in over-all rig activity. For example, there were 204 rotary rigs active the first week of July, a drop of 22.4% over that date in 1957.

The success ratio also is slightly above that of last year. The 19.8% wildcat success rate in the first half shades last year's 19.49%, but both are well above the national average. However, it's the quality of Oklahoma strikes that counts, and most discoveries this year should mean more drilling business later when development campaigns get under way.

The Oklahoma wildcatting trend is unmatched by any other single state. Wildcatting in North Dakota and Mississippi increased only slightly this year. Activity in all other states has declined.

The big play . . . Significant Oklahoma wildcat successes this year—and for some years to come—are influenced by the geology of the Anadarko basin.

This play is featured by deep drilling and multipay zones. The high cost involved is limiting participants to the well-known major oil companies and joint ventures among the better financed and equipped independents.

Successes have centered in the northwest part of the state where big new gas reserves are being opened up and in the central portion where deep Ordovician oil is the target.

Both these areas are in the sprawling Anadarko basin which spreads in a northwest direction over Oklahoma, the Texas Panhandle, southeastern Colorado, and southwestern Kansas.

Explorers report nearly every geologic system is represented in the basin (OGJ, April 21, p. 230).

Of the basin's 11 producing zones, the Morrow sandstones of lower Pennsylvanian age are the most attractive to drillers in the northwest.

The Morrow sandstones are producing oil and gas in about 157 fields there. Excellent success ratios and high reserves per well have made the Morrow exploration attractive. In addition, drillers aiming for the Morrow also can test the deeper Mississippian at only slightly extra cost. This has resulted in a large number of fields producing both from Mississippian and Pennsylvanian rocks.

Other features of this oil-gas play in the northern part of the basin:

. . . Subsurface geology is important since most of the oil and gas discovered so far occurs in stratigraphic or structural-stratigraphic traps.

... **Success ratio** of nearly 50% can be expected to improve when more subsurface controls are available.

... **Drilling costs** are about $8 per foot for wildcat wells and $11 average for all wells drilled.

... **Gas is more profitable** than oil, although a good return is possible from either.

Development of this region as a major gas area has brought offers to producers of record prices from several major pipelines which originate there.

These firms are offering 20 to 21½ cents an M.c.f. for gas in Harper, Beaver, Woodward, Woods, and Ellis counties.

Until 2 or 3 years ago, the going price for gas in the Oklahoma Panhandle was 10 to 12 cents.

In the southern portion of the basin superdeep drilling continues in the search for Ordovician oil. Chief target is the Simpson group.

Flush strikes with multipay zones have touched off this intensive campaign in Cleveland, McClain, Grady, Stephens, and Garvin counties. The play has been building up for 3 years and is getting a major impetus this year.

The northwest . . . Several significant developments during the first half enhanced the potential of this region.

Most important probably is Sinclair's 1 Holcomb, north of the town of Buffalo in Harper County. It found six potential pay zones climaxed by the Arbuckle-Ordovician at 7,664 ft. The Arbuckle flow was 314 bbl. of 48°-gravity oil in 24 hours on 30/64-in. choke between 7,664 and 7,717 ft. Gas was tested earlier in the Kansas City-Pennsylvanian lime, the Oswego, Mississippi lime, and Viola.

Importance of the strike is this: It opens a vast area of western Kansas and western Oklahoma to Arbuckle-Ordovician exploration. Nearest Arbuckle production is in Yellowstone field in Woods County, 40 miles northeast. The last prior discovery in the Anadarko basin of the Arbuckle was 4 years ago in Scott County, Kansas, far to the northwest. The Arbuckle is equivalent to the Ellenburger in Texas and its fields are usually prolific and long-producing.

Two new western Oklahoma counties also stand good chances to be put into the production column. They are:

... **Custer,** where Magnolia's 1 Miller is an apparent gas discovery. Springer sand perforations at 11,464-82 ft. made 1,250 M.c.f. of gas daily through ½-in. choke. Magnolia has extended contract to the Ordovician at 16,000 ft. Well currently is below 12,500 ft.

OKLAHOMA WILDCATTING—FIRST 6 MONTHS

	Total	Crude	Cond.	Gas	Dry
January	123	12	3	7	101
February	60	10	3	5	42
March	50	7	0	2	41
April	45	5	4	3	33
May	88	8	4	2	74
June	77	9	2	2	64
Totals	443	51	16	21	355
1957	354	50	10	9	285
1956	467	80	...	25	362

... **Blaine,** where Miles Jackson 1 Haigler is attracting interest. On a drill-stem test of the Morrow-Pennsylvanian at 8,610-8,750 ft., this well recovered 2,228 ft. of 42°-gravity oil. Nearest oil field is 20 miles northeast at Ringwood, and nearest gas production is 12 miles northeast at Northwest O'Keene.

If either of these wells lives up to expectations, it will open up new areas for drilling.

Another first-half highlight in northwestern Oklahoma is the continued growth of what is known as the "Woodward trend" in Ellis, Woodward, and Major counties.

The seventh pre-Permian field in Woodward County alone was brought in by Calvert Drilling Co.'s 1 Young, 15 miles northeast of the city of Woodward. The well opened Northeast Woodward field by flowing 2,000 M.c.f. daily prior to acid treatment.

The fifth active producing area was given Ellis County by Magnolia's 1 Schoenhals, a gas-distillate discovery. Flow from four intervals in the Morrow was 112 bbl. of distillate and 5,780 M.c.f. of gas daily through 24/64-in. choke.

Major County also shared in the new developments when Shell's 1-19 Culp extended Cedardale field of Woodward County eastward into Major. A drill-stem test at 6,283-6,307 ft. got a 3,210 M.c.f. daily.

North of the Woodward trend, Union Oil of California linked the prolific Laverne and Highland gas districts with the 1 Riggs. The wildcat found gas in Hoover sand-Pennsylvanian, proving up the area between the two pre-Permian gas areas which cover western Harper and eastern Beaver counties.

Deep in the middle . . . Several points of interest are developing in Oklahoma's central region.

Gulf Oil Corp. has been particularly fortunate.

It started off the year with the 1 Beard near Payne in McClain County. Tests indicated open flow potential of 100 bbl. hourly from first and second Bromide and Tulip Creek sands. This triple threat discovery pushed the deep-Ordovician fault-trend play in this area farther south and west.

Only a few months later, Gulf's 1 McKinney unit a few miles south in Stephens County showed tremendous potential reserves and extended the ultradeep Ordovician Carter-Knox field 3 miles southeast. Open-flow potential was calculated at 21,500 M.c.f. of gas and 2,250 bbl. of condensate daily. The well had 120 ft. of pay just above 15,000 ft. in the second and third Bromide sands.

In the western part of this region, the big news was Shell's 5 Rumberger in Elk City field which gave Oklahoma a new drilling depth record for the second time in less than a year.

The well last week was heading toward 21,500 ft. It already has taken over the depth record set last summer by Magnolia's 1 Sterba-Ordovician in Cement field, Caddo County, which went to 20,426 ft.

The 5 Rumberger found gas shows near 20,100 ft. in the Morrow-Pennsylvanian, but is drilling farther into the thick Morrow sand with an objective in the Springer.

East of the Shell venture, Howell & Howell 1 Anadarko basin in Caddo County, currently near 18,000 ft., is also attracting interest among basin operators. The well is running structurally high.

The Shell and Howell wells are testing the seemingly bottomless trough of the basin. Most basin production now is in the southeast corner, on the northwestern shelves, and along the Amarillo-Wichita, Mountain uplift. Much of the ultradeep center is still to be tested.

Other activity . . . Significant discoveries also dot fringes of the state outside the Anadarko basin. These include:

... **The Ardmore-Marietta basin.** This area in Love, Marshall, and Bryant counties along the Oklahoma-Texas border is very active.

Sinclair turned up two discoveries in the first half of the year. The 1

Tucker in Love County made open flow of 11,700 M.c.f. of gas daily with 97 bbl. of condensate per million in testing Oil Creek sand from 10,620-10,722 ft.

Its 1 Anderson in Bryan County exposed the Bromide at 7,196-7,259 ft. and 7,280-86 ft. and McLish at 7,824-80 ft. Tests made 1,152 M.c.f. in the Bromide and 1,470 M.c.f. daily with 65 bbl. condensate in 12 hours from the McLish.

Pasotex Petroleum has completed its 1 Brannan as the second producer in the deep southeast Marietta sector of Love County. Oil Creek sand was perforated at 13,924-84 ft. and flowed 7,230 M.c.f. of gas and 600 bbl. of condensate daily through 18/64-in. choke. Open flow potential was 30,500 M.c.f. and 2,531 bbl. condensate daily.

... New gas for McAlester basin in McIntosh County.

Existence of substantial gas reservoirs in McIntosh County have been indicated by exploration in 17 separate areas.

An example of the potential may be seen in Oklahoma Natural Gas 1 Covey. Operator perforated the basal Atoka at 2,261-94 ft. and the Cromwell at 2,386-94 ft. The Cromwell exhibited open-flow capacity of 9,700 M.c.f. daily, and the combined flow of both zones reached 15,400 M.c.f.

The gas play has caused an accelerated lease-buying campaign throughout the McAlester, Eufaula, and Stigler areas with the majors and independents both participating.

... The Hardeman - Hollis basin. Atlantic Refining Co.'s 1 Hulett in Jackson County has made excellent shows of oil in three zones down to 6,760 ft. This well is 18 miles west of nearest production in Altus field and is the first indication of success this far out in the basin. The region is an eastern arm of Palo Duro basin in Texas.

The outlook ... With all this activity in widely scattered sections of the state, it's easy to understand why oil men predict Oklahoma will be good wildcatting country for years yet.

Wildcat ventures successfully undertaken in the first half of 1958 alone are setting the stage for later development drilling. Besides, wildcatting in the vast Anadarko basin and in other areas associated with it has just begun.

And add to this bright outlook another fact: Oil men steadily are turning up small strikes in the older, settled producing areas, such as Osage, Creek, and Okmulgee counties.

Oil Found At Calcasieu Dome

OIL DISCOVERY at Calcasieu Lake in southern Louisiana again proves the oil man's adage: Never condemn a salt dome.

Over the last 30 years, drillers have put down 40 dry holes into Calcasieu's salt dome in an attempt to find oil. The dome is the last of South Louisiana's known old shallow piercement-type domes to defy oil men's efforts.

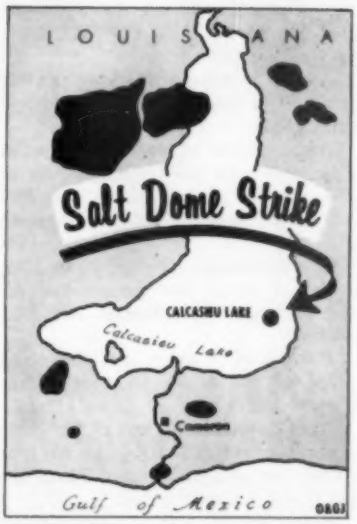
Hunt Oil Co., most recent in the succession of eight operators to try their hand, has finally met with success. It is completing the dome's first well—a 400-bbl.-daily oil producer. The flow of 32°-gravity oil is through ⅛-in. choke from an 11,834-38-ft. pay zone.

The oil sand flanks the dome, underlying a salt overhang off the east side. The hole was drilled to a total depth of 14,054 ft. which makes it the second deepest test on the structure.

The venture was Hunt's second attempt to find oil in the dome. The first was abandoned at 13,325 ft. because of a mechanical failure. Hunt is operator on the project, a joint venture with Pan American Petroleum Corp.

The operation is on a state lease farmed out from The Texas Co. which previously had drilled several deep dry holes. The well is more than 5 miles from nearest production at Cameron, just inshore from the Gulf of Mexico.

The dome itself is located in the southeastern portion of Calcasieu



Lake more than a mile offshore in Cameron Parish. It was discovered by Louisiana Land & Exploration Co. with two tests drilled in 1927 and 1928. Both were relatively shallow, located on top of the dome.

Since then The Texas Co., Federal Royalty Co., Superior Oil Co., Continental Oil Co., Duval Texas Sulphur Co., W. T. Burton, Humble Oil & Refining Co., and lastly Hunt and Pan American had their turn at wildcatting on and around this dome.

Some of these paid fancy prices for state lease tracts around the dome.

PIPELINE BRIEFS . . .

Hearings are being conducted by the California Public Utilities Commission in Los Angeles on an application by Southern Counties Gas Co. to build a 20-mile, 24-in. natural gas pipeline in Riverside County. The line will parallel an existing 16-in. line. It will increase deliveries by Southern Counties to San Diego Gas & Electric Co. by more than 13,000,000 cu. ft. daily.

Northern Natural Gas Co. has temporary FPC approval to build a 2,000-hp. compressor station to inject natural gas in its Redfield, Iowa, storage field for testing the Mount Simon formation. The FPC directed Northern to ascertain the degree of communication between the Mount Simon and overlying formations. Gas inventory in Mount Simon will be limited to 8 billion cubic feet.

Michigan Wisconsin Pipe Line Co. has awarded contracts to Ford, Bacon & Davis Construction Corp. to build 10 compressor stations and expand five existing stations. Nine new intermediate stations will be 3,500 hp. and the new Wisconsin "B" station will be 3,600 hp. The projects are to be completed by October 1.

Cities Service Gas Co. is installing 9,700 hp. in three stations in Kansas. Company personnel are constructing 7,000 hp. at the Grabham station, to be completed October 1. Foor Engineering Co. is installing a 1,350-hp. compressor at Ulysses. Another 1,350 hp. to be completed December 31 will be installed at the Sublette station.

Arabian American Oil Co. is winding up the expansion of one station

Drillers Get Nearer 24,000 ft.

THE WORLD'S deepest well plunged toward 24,000 ft. last week in Pecos County, Texas while the second deepest well 30 miles away paused to run casing at 23,000 ft.

All went according to schedule with Phillips Petroleum Co.'s 1-EE University, which drilled below 23,889 ft. at a rate of about 50 ft. per day.

The Phillips' 1-A Montgomery planned to set 7-in. casing to total depth at 23,000 ft. in the Ellenburger and then drill another 400 ft. of open hole.

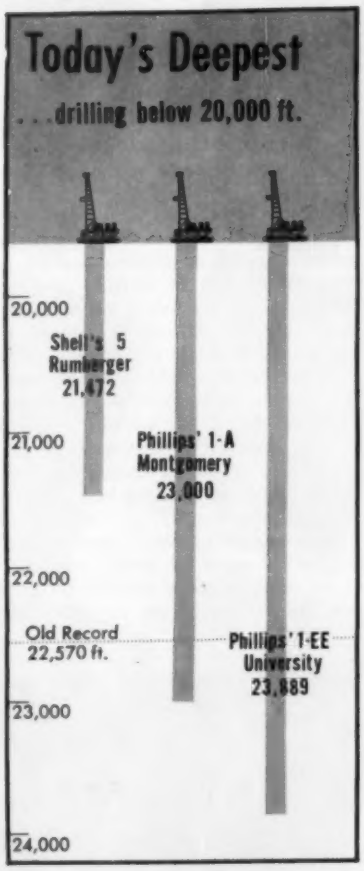
The 1-EE University, drilled by a Phillips crew, was still in the Simpson formation. Geologists expected to find the base Ellenburger, the objective, at around 24,400 ft.

Great Western Drilling Co. is the drilling contractor on the 1-A Montgomery.

In Oklahoma's Elk City field, Shell Oil Co.'s 5 Rumberger, drilled by Helmerich & Payne, was making 25 ft. per day below 21,472 ft. and expected to go at least to 22,000 ft. There is still some question as to whether the well has pierced the Springer objective or is still in the Morrow.

Meanwhile, another deep Phillips test in Pecos County, the 1-A Harral, has had some trouble with gas behind the production string. The 1-A Harral has bottomed out at 19,020, and Phillips is planning to test.

Currently a series of perforations are being made up and down the hole and block squeezed to seal off the gas leak.



New Mexico Acreage Leased

THE TEXAS CO. last week acquired a 50,000-acre oil and gas lease on the west outskirts of Albuquerque, N. M., making its total lease holdings in the area approximately 90,000 acres.

Texaco leased the acreage out of the Atrisco Grant for a consideration of $61,891. Term of the lease is 10 years, from July 6, 1957.

The grant is situated in Townships 9, 10, and 11n, Ranges 1w and 1, 2, and 3e. The lease does not include commitment to drill. Albuquerque is about 100 miles southeast of the big San Juan gas field.

Calco Appeals Tax Ruling

THE CALIFORNIA CO. has asked the Colorado Supreme Court to declare unconstitutional the state's 1953 law which taxes the gross income on all oil and gas produced in Colorado.

Calco made the request in appealing a February 15 decision by a Denver District Court which held this so-called severance tax on oil and gas production is valid and proper.

The appeal asked for a refund of $947,430 in taxes paid by Calco, plus interest. It also requested an injunction to halt the transfer of money collected under the tax to the state general fund.

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and will complete a new one in September. Aramco is adding a 1,700-hp. diesel unit at Nariyah, Saudi Arabia, on the Qatif-Qaisumah line. A 4,000-hp. station is being built at Khursaniyah with four combustion-gas turbines on the Safaniya-Ras Tanura pipeline. Contractor is IBBI.

Kansas-Nebraska Natural Gas Co., Inc., is building 48½ miles of gathering lines 4 to 6-in. in diameter in Colorado, Kansas, and Oklahoma. Brodie Construction Co., Amarillo, Tex., has the contract for all but 3 miles in Unruh field, Kansas, which was let to Nichols Construction Co., Great Bend, Kans. Construction will be completed in the fall.

Texas Eastern Transmission Corp., Little Inch Division, plans a 62-mile, 8-in. products pipeline this year from Tyler, Tex., to Carthage, Tex. A 750-hp. pump station will be constructed at Tyler.

Pioneer Gathering System, Inc., Amarillo, Tex., will build a plant 20 miles northwest of Sonora, Tex., to remove carbon dioxide and hydrogen sulfide from 12,000 M.c.f. of natural gas daily. The gas is produced in Clayton Ranch, Addie, and Vinegarone fields and sold to Permian Basin Pipeline Co. A dehydration plant also will be built at the site. Baird & Co., Tulsa, the contractor, will begin construction August 15.

Sinclair Pipe Line Co. has started a takeup and reconditioning project involving 140 miles of 12-in. and 140 miles of parallel 8-in. from its Colonels station, near Teague, Tex., to Huffman station, 25 miles from Houston. Trojan Construction Co., Oklahoma City, was the successful bidder. Part of the pipe, replaced by a newly constructed 20-in. line, will be salvaged for use elsewhere on the Sinclair system, and the remainder will be sold. Two 12-in. lines from Huffman to Houston will be left in the ground.

Also for Pipeliners . . .

IN THE NEWS: Middle East pipelines still operating but plans are being made to replace their flow in case of an emergency (p. 47) . . . Cherokee Pipe Line completes first phase of Ponca City-Wood River expansion in its products system (p. 52).

PLUS THESE TECHNICAL REPORTS: Plastic covering gives floating-roof performance in fixed-roof tanks (p. 100) . . . Nitrogen keeps line corrosion-free (p. 107).

Computers Go to Work

. . . on tough problems for Socony's world-wide operations. Data transmitted by wire is fed to electronic devices.

SOCONY MOBIL Oil Co. is developing a worldwide network of electronic computers linked by transceivers and other swift means of communication.

The network already is used to help solve such complex problems as oil-well spacing and possible shifts in marketing patterns in Europe, West Africa, and the United States.

Socony took the wraps off its new operational nerve system last week when trials were completed for two key elements. These are a $2 million IBM 704 computer at the company's electronic computer center at its New York City headquarters, and a transceiver hookup with the Socony research laboratories and refinery at Paulsboro N. J., 97 miles away.

Electric impulses received by wire in New York on punch cards provide the computer with data on the type of crude on hand at Paulsboro, types of products desired, and other pertinent information. The computer's recommendations on the best use of refinery facilities are relayed back to the refinery.

The whole procedure takes about 5 minutes, compared with the manual method taking two men half a day.

Socony's computer center also has a smaller computer, an IBM 650 using magnetic tape, along with punch card accounting equipment and an electric printer.

The center occupies more than 10,000 sq. ft. of floor space.

Joint effort . . . Data from outside the New York area is usually sent by air to the center on punch cards. This includes material preprocessed by other computers at the Dallas office of Magnolia Petroleum Co. A similar arrangement is being worked out with General Petroleum Corp., Socony's west coast affiliate, which has a computer in Los Angeles.

Dr. J. S. Aronofsky, manager of the center, says that "for the cost of an airmail stamp, Mobil people all over the world can get the thinking of an electronic 'brain' for any problem worthy of its talents."

Two or more computers often work together. For example, exploration and drilling problems in Texas are first sorted by a smaller unit in Dallas. The partially solved problems are then mailed to New York for a run through the 704, which can complete the solution 50 times faster.

Piece de resistance . . . Socony is attempting to express the operations of its refineries as mathematical equations which can be cranked into the computer. It has found that each refinery's operations can be represented by some 200 or more equations. Once this pattern is established, the computer data can be used to control operations around the world.

For reasons of business secrecy, some sets of punch cards bear code names, such as "floating bum," "walk through the woods," or "confusion." The computer operators have no idea of the nature of the subject matter.

In between more colorful projects, the center grinds out payrolls, sales statistics, and other financial records. In September, it will begin processing all dividend checks electronically.

Rate Change Rule Relaxed

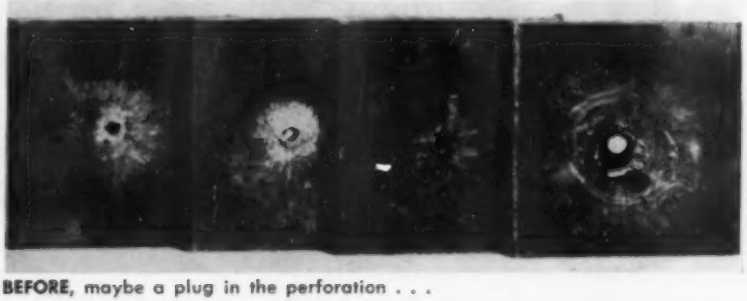
THE FEDERAL Power Commission has relaxed its rules to ease the impact on producers of the 1-cent increase in the Louisiana gas-gathering tax next month.

The FPC will permit Louisiana producers to file rate changes reflecting the higher tax on less than the usual 30 days' notice.

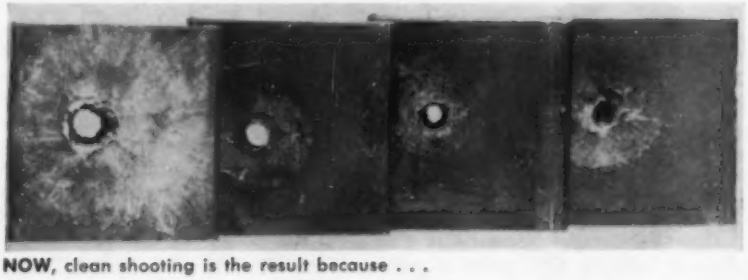
The new tax, which will apply for 2 years beginning August 1, may result in increases to purchasers under rate schedules which provide that the buyer is to reimburse the seller for any portion of the additional tax.

The FPC said, however, that since pipelines plan to challenge the tax, it will suspend rate schedule changes for 1 day following the proposed effective date.

This will assure a refund if the tax should be thrown out by the courts, FPC said.



BEFORE, maybe a plug in the perforation . . .



NOW, clean shooting is the result because . . .

New Jet Charge Eliminates Carrot

A NEW JET-perforating charge which does not create a carrot in the process of jet formation has been designed by Jet Research Center, Inc.

The new charge eliminates one of the problems of a successful perforating job: The deposition of a slug, or carrot, in the hole. This partial plug often causes a restriction in the newly created flow channel.

Jet Research Center used its highly successful 2-in. Dyna-Jet charge as a basis for the new tool, which is called Super Dyna-Jet. The major change made was in the liner. An unnamed new material and technique were employed in its fabrication.

The result was creation of a carrot-free jet which leaves nothing to plug drainage areas or impede production flows.

The new charge the company says, will require no change in loading techniques or loading tools.

Assures control of paraffin viscosity

EPOLENE "N"

Viscosity control of paraffin formulations calling for the addition of polyethylene is assured—if Epolene "N", Eastman polyethylene wax, is used. Because uniformity of coating paraffins is so important, Eastman takes special care to produce Epolene between narrow limits of viscosity.

Published specifications for the viscosity of Epolene "N" are within the range of 2200 and 2700 cps at 125° C—your assurance of close control and uniformity from batch to batch.

The table shows what this uniformity means in polyethylene-based paraffin formulations. Five percent samples of Epolene "N", from the *extremes* of our production range, were mixed with paraffin—and the viscosities of the resulting mixtures were taken on the same Brookfield Viscometer.

Sample	Viscosity at 200° F (cps)
100% paraffin	4.8
95% paraffin—5% Epolene "N" (2250 cps)	7.5
95% paraffin—5% Epolene "N" (2700 cps)	7.6

Although viscosity varies from paraffin to paraffin, these results dramatize the advantage of using Epolene "N". Thus, for the paraffin under test, the maximum variation encountered in the final viscosity of the 5% Epolene blend was only 0.1 centipoise.

To assist manufacturers in taking full advantages of the outstanding properties of Epolene "N", Eastman maintains an extensive technical service laboratory in Kingsport, Tennessee. Through this laboratory, paraffin formulators are offered expert assistance in formulations and manufacturing techniques.

For samples and further information, write Eastman Chemical Products, Inc., subsidiary of Eastman Kodak Company, Chemicals Division, Kingsport, Tennessee.

Epolene

EASTMAN POLYETHYLENE WAXES

SALES OFFICES: Eastman Chemical Products, Inc. Kingsport, Tennessee; New York City; Framingham Mass.; Cincinnati; Cleveland; Chicago; St. Louis; Houston
West Coast: Wilson Meyer Co., San Francisco Los Angeles; Portland; Salt Lake City; Seattle

Cities Service shows how to cut valve costs

Crane globe valve in 14th year on steam turbine line

Cities Service Refining Corp. uses hundreds of valves at its Lake Charles, La., plant. Maintenance and replacement costs could be staggering, but for careful control of valve selection.

For example, the Crane 6-inch, 300-pound steel globe valve shown above was installed at the Lake Charles plant 14 years ago. Working at 250 psi., 600 deg. F., the valve is used in the steam line to a turbine-driven feed-water pump.

In spite of its operation 3 or 4 times a week, this sturdy Crane valve has continued tight in service and has required no repairs in 14 years!

Thrifty buyers want no better reward than the kind of cost-cutting, dependable service they get when Crane valves are installed.

That's why in the petroleum industry, as in all industries, you'll find more Crane valves used than any other make.

This is the valve used on installation above. CRANE 151XR, 300-pound cast steel globe valve for 850° F. maximum temp. Sizes: 2 in. to 8 in. For full details, see your Crane Representative, or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

SOCONY DIRECTORS* pose for their first portrait in their new board room. Their meetings provide . . .

Socony Plans to Share in Oil's Growth

SOCONY MOBIL Oil Co., Inc., foresees a 50% increase in the Free World demand for oil products in the next 10 years and it "intends to have a healthy share of this growing market."

That intention is expressed in a special report to employes. Whether the company succeeds or fails in this ambition is pretty much up to the group pictured here.

These men make up the board of directors of Socony, third largest U.S. oil company and one of the world's largest corporations. Its total assets at the beginning of this year were $3,105,252,019 and last year it did $2,976,103,847 worth of business. Its operations are worldwide.

Twelve of the 13 men who make up the board are full-time, working directors. The lone nonworking member is Dr. Grayson Kirk, president of Columbia University.

The fact that the directors are, with a single exception, operating men gives the board a flexibility that is uncommon in corporate management.

Socony directors get together every Tuesday morning. The executive committee can, and almost always does, meet daily. The executive committee, made up of five directors and its chairman, has precisely the same powers as the full board when the latter is not in session.

Albert L. Nickerson, president and chief executive officer of the company, is chairman of the executive committee. Other "permanent" members are Fred W. Bartlett, chairman, John F. Seal, vice president for finance, Clark S. Teitsworth, vice president for supply and distribution, and Herbert Willetts, vice president for employe relations and petroleum chemicals. The sixth membership is rotated on a monthly basis among the remaining directors.

Socony makes a point of decentralization of authority. While each director has a portfolio, such as George Dunham, executive for manufacturing, the actual operation of the manufacturing division is in the hands of its general manager.

Primary function of the board is policy making. And part of that policy is that decisions, to the fullest extent possible, should be made in the field. It has delegated to management people rather specific limits of authority and it expects them to make decisions within that sphere.

Day-to-day operating matters that get to the director level are usually dealt with at the almost daily meetings of the executive committee. Meetings of this committee are generally called by its chairman. However, any member has the authority to call the committe together if, in his judgment, a matter warrants the consideration of the group.

The board devotes considerable attention to financial matters. As in most companies, the controlling factor is the budget, which Socony's board considers in December of each year.

The board sees to it that the budget fits within the company's resources, its foreward planning, and its profitability. While the budget represents the directors best decision at the time, the board does not regard it as a straitjacket.

Key control in budget matters is the board's scrutiny of what it calls the company's "cash outlook." Three times each year the board takes a good look at how the company stands in relation to the calendar year and to the two succeeding years.

This 3-year outlook is prepared by the treasurer's office and it considers every known element of income and outgo. It gives the directors the best possible estimate of where the company stands and where it is going.

Other departments also report from time to time to the directors. Their chief reliance, however, is on the coordination committee. This top management group screens and reviews interdepartmental and interfunctional activities to determine which serve the company's interests best. The coordination committee relies heavily, in turn, on the main committees within the company—marketing, production, manufacturing, etc.

It adds up to the modus operandi by which Socony's top brass hopes to get a "healthy share" of the growing Free World market for oil.

*Left to right: Vernon A. Bellman, executive for domestic marketing; George S. Dunham, executive for manufacturing; Clark S. Teitsworth, vice president for supply and distribution; John F. Seal, vice president for finance; Paul V. Keyser, Jr., vice president for foreign trade; Dallas R. Lamont, executive for research; Fred H. Wilcox, executive for producing; Robert Siegel, executive for Middle East affairs; Fred W. Bartlett, chairman of the board; Albert L. Nickerson, president; Herman J. Schmidt, chief legal officer; Herbert Willetts, vice president for employe relations and petrochemicals; and Dr. Grayson Kirk.

Atom Won't Hurt Oil Much

. . . during next 22 years, study shows. Natural gas will, however, suffer a percentage drop in the energy market.

NUCLEAR POWER may be supplying almost 10% of this country's energy needs by 1980.

But the oil industry won't be hurt materially by it.

The National Planning Association, a nonprofit organization, has issued a report on "Nuclear Energy and the U. S. Fuel Economy" and comes up with the following figures:

. . . **The oil industry** may lose a market for around 410 million barrels of oil and 538 billion cubic feet of gas per year.

. . . **But, against this,** domestic oil consumption will soar to 16 million barrels daily by 1980, and oil's share of the energy market actually will increase to 41.5%, compared with 41.1% in 1955.

. . . **Natural gas** will drop to 23.1% of the energy market in 1980, compared with 26.7% in 1955.

The major impact of nuclear power will fall on the market for boiler fuel. But the NPA sees the industry as turning to other and higher-return outlets.

About half of the conventional fuel displaced by the atom will be in the field of electric power and industrial process. Atomic vessels, military and merchant, will account for much of the rest. Atomic trains and other uses will cut in less sharply.

Coal's hold on the boiler-fuel market will increase as natural gas becomes too costly and refiners show less interest in producing residual fuel oil.

Nuclear energy, accordingly, may take over markets for foreign fuel oil only.

Issue is cost . . . The NPA study, approved by a 17-member policy committee, disclosed that competition between atomic power and conventional fuels will be based on cost.

As a result, development of this new source of energy in the U. S. will appeal more to New England, the upper Midwest and Florida, where fuel prices are above the national average.

The real center of nuclear energy activity over the next quarter-century will be in the European nations anxious to cut their fuel costs and reduce their dependence on Middle East oil.

Nuclear power will act to some extent as a brake on oil prices. But the NPA sees synthetic liquid fuels or increased reliance on foreign oil as a more immediate and direct price ceiling on crude and products.

With the nation's energy demands doubling in the next 22 years, the NPA says that "no single energy source will be able to satisfy all of the projected needs."

Plenty of reserves . . . The NPA study rejects the idea that the U. S. is going to run out of oil. Petroleum reserves are supplemented by oil shale, gasified coal, and perhaps Canadian tar sands.

"Energy supply prospects for conventional fuels in the United States are sufficiently promising over the next couple of decades that no more than an increase of 15-20% in the constant dollar delivered price of fuels should be expected," the study says.

The NPA reasons that the U. S. won't run out of oil this way because reserve figures represent only the oil that could be produced at today's prices. The proved reserves of 35 billion barrels could be raised by 184 billion barrels if higher prices and more economical recovery methods develop.

Added to this are some 45 billion barrels of shale oil recoverable by present methods at present prices. Higher prices could increase this by 855 billion barrels.

The development of nuclear energy, while cutting into some markets for oil, may at the same time bring about greater demand for it as atomic-powered industrial activity expands, the report predicts.

The NPA points also to the future development of a synthetic oil industry, based perhaps on coal liquefaction and high temperature nuclear heat, as a means of providing added assurance of a long-run domestic supply of liquid fuels.

INDUSTRY BRIEFS . . .

Phillips Petroleum Co. will develop a large block in Benedum-Trees field in northeastern Ohio. The company has completed a lease agreement with John A. McGuire, Erie, Pa., covering 73,260 acres in Ashtabula, Portage, and Trumbull counties.

Phillips will develop the acreage in 1,000-acre units. Development and drilling costs will be paid by Phillips, with McGuire receiving a share of production. Cash consideration was $146,520. The field was opened last year by the Benedum-Trees Oil Co. 1 Scribner, a lower Silurian oil discovery in Ashtabula County. The discovery flowed 151 bbl. daily on ⅛-in. choke (OGJ, Jan. 27, p. 133).

Ashton Mouton, former mayor of Lafayette, La., and an oil leaseman, has taken over as Louisiana's new conservation commissioner. Gov. Earl Long appointed Mouton after Commissioner John B. Hussey resigned to accept appointment to the Federal Power Commission.

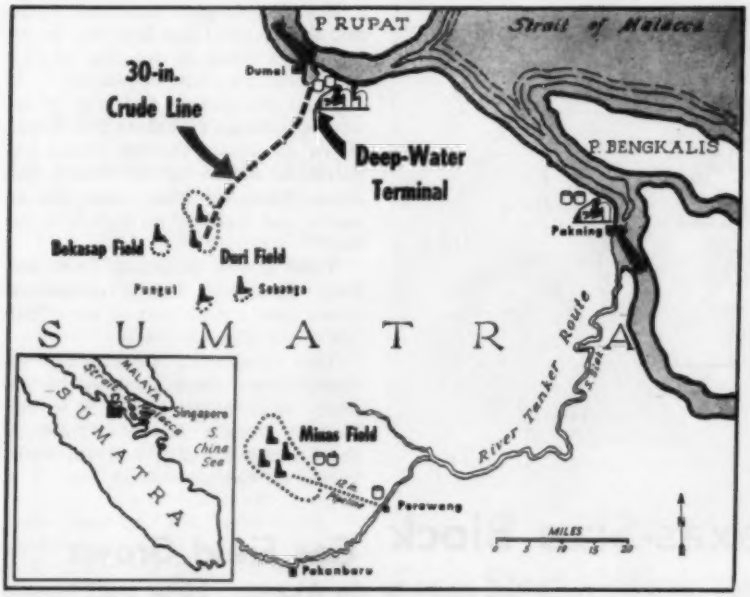
Tradewinds Exploration, Inc., has acquired from Talent Oil & Gas Co. a 52,455-acre oil and gas exploration tract in the Peigan Indian Reserve of Alberta. The tract is located 95 miles south of Calgary in the Foothills belt, 18 miles northeast of the prolific new Waterton gas field. Tradewinds plans to drill a 12,000-ft. well to test the Mississippian and perhaps go deeper to test the Devonian. Talent Oil received an undisclosed amount of Tradewinds common stock in the deal.

Merger of Canso Natural Gas, Ltd., and Canso Oil Producers, Ltd., has been approved by shareholders at meetings held in Calgary, Alta., Canada. The merged companies will be known as United Canso Oil & Gas, Ltd.

United Canso holds interests in 2,882,315 acres in Alberta, Saskatchewan, British Columbia, Quebec, and the Yukon territory. Approximately 400,000 bbl. of oil and 2.6 billion cubic feet of gas were produced from these properties in 1957.

The city of Hugoton, Kans., is landscaping the area around its city-owned gas well in preparation for building a natural-gas museum—only one of its kind in the world.

The Hugoton gas field started in the Hugoton area, and the Chamber of Commerce plans to capitalize on this distinction by raising funds to build a park and museum that will contain exhibits, equipment, and documents relating to the history of natural gas.



Big Terminal Opened

. . . in Indonesia. Caltex moves first oil from Duri field through Far East's biggest pipeline to new facilities.

INDONESIA'S minister of industries, S. J. Inkiriwang, stepped up to a glistening valve last week at Dumai, gave it a turn, and started the first crude from a new Indonesian oil field into a 38,545-ton tanker.

The turn of the valve signaled the official opening of Caltex Pacific Oil Co.'s new deep-water loading terminal, served by easily the biggest pipeline in the Far East. The ceremonies took place at Dumai, once a sleepy little fishing village on the Rupat Strait. Four months ago the area was swarming with defiant rebel riflemen vowing to take control of the area from Djakarta in Indonesia's almost comic-opera revolution.

Last week's big event represented a number of "firsts" for this region of Central Sumatra. All are part of Caltex's $50 million expansion program started more than a year ago (OGJ, Apr. 1, 1957, p. 98).

The tanker, "The Runner," was the first ocean-going vessel ever to dock at Dumai. It was loaded with the first 22°-gravity crude shipped from Duri field which Caltex has been developing feverishly for the past 18 months. A 36-mile, 30-in. pipeline connects the field with the new deep-water terminal at Dumai.

The field . . . The shallow, 800-ft. Miocene sand formation at Duri was discovered by Caltex in 1940.

But only four wells were completed before the outbreak of World War II and the Japanese invasion of the island. Only about 56,000 bbl. of the oil was produced up to 1956, but then things began to pick up.

Caltex now has two rigs running at Duri and has completed 120 wells. The drilling is not as easy as the deceptively shallow pay might lead one to believe. Moving in, rigging up, and moving out of the swamps create problems for the drillers.

The pipeline . . . The big 30-in. pipeline is by far the largest in Indonesia and the entire Far East.

It's now serving only Duri, but eventually a 14-in. line will add the production of Bekasap field, about 5 miles to the west, to the line. Bekasap, found in 1955, produces a much lighter 35°-gravity crude from a 3,000-ft. pay.

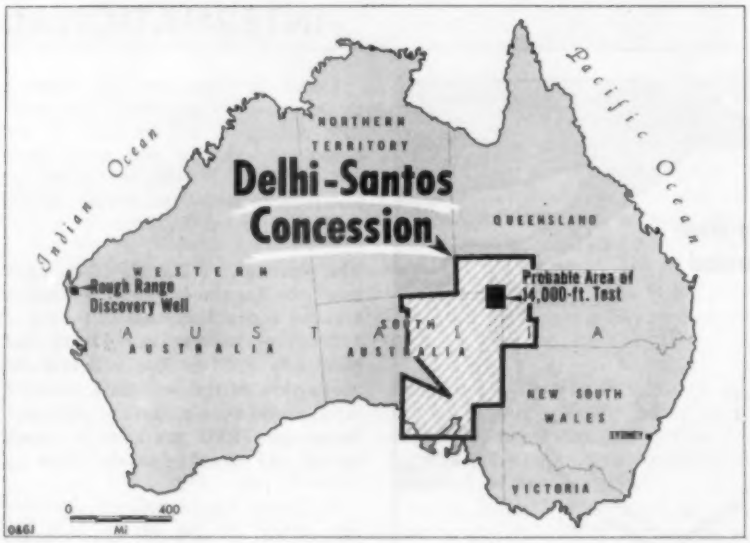
If Caltex has a definite timetable for adding its big Minas field, 30 miles to the south, to the big-inch line, the company is keeping that to itself. This is obviously the next step in the expansion program. Minas, which produces more than 150,000 bbl. daily, moves its crude down the Siak River in small tankers to an old terminal at Pakning.

The terminal . . . Caltex changed the whole face of the little fishing village in building its new terminal.

The terminal's facilities include more than 1,000,000 bbl. of storage, a modern deep-water loading pier that will serve supertankers, a modern power station, and employe housing.

In addition, the company built a new deep-water general cargo pier for freighters and the housing necessary for Indonesian officials of immigrating, customs, and harbor services.

JUNGLE VICTORY was celebrated upon completion of two-lane road along new pipeline from Duri field to coast. The road is part of Caltex's big expansion.



Delhi Probes Texas-Size Block

DELHI Australian Petroleum, Ltd., is moving fast to find out what's under a big hunk of Australia.

The company has dispatched a geologist to the country. He will direct oil exploration activities in a concession area bigger than the State of Texas under Delhi-Taylor Oil Corp.'s recent deal with the Australian firm, Santos, Ltd.

Plans are to put seismic crews to work soon. Informed sources say Delhi will drill its first well, a 14,000-ft. hole required under the contract with Santos (OGJ, May 12, p. 97), on one of several structures in the corner area of southwestern Queensland and northeastern South Australia.

First seismic work will be in this area. From this, Delhi intends to fix the depth of the sediments and hopes to confirm folding in depth. It will search for suitable traps, either structural or stratigraphic.

Shallow strat tests . . . The company will follow the seismic work closely with shallow strat tests to about 1,000 ft. to confirm its seismic findings on structural conditions. It will log all holes for correlation purposes.

All this work will be aimed at selecting a site in the general area mentioned for its 14,000-ft. test.

If, after this wildcat, Delhi still wants to proceed further it will be required to spend $500,000 a year for 4 years to continue its rights. It thus can acquire a permanent half interest in the concession.

The huge 267,000-sq.-mile concession (which compares with 263,500 sq. miles for Texas) lies mostly in the great Artesian basin of east-central Australia. The bulk of it is in the province of South Australia. It is a vast region of desert and sheep range land which Delhi officials say greatly resembles geologically the French Sahara area in Africa.

Lone discovery . . . Australia is wholly dependent on imports. Consumption is about 175,000 bbl. daily and is growing rapidly.

The lone discovery in Australia is in the extreme western part of the country in the Exmouth Gulf area, hundreds of miles away from the Delhi-Santos acreage.

Four years ago, West Australia Petroleum Pty., Ltd., (WAPET) brought in its Rough Range 1 discovery for 550 bbl. daily. But five offsets were dry, and since then WAPET has closed the books on that area (OGJ, Apr. 14, p. 84).

Texans Buy Control of Talon

A TEXAS syndicate has bought controlling interest in Talon Petroleum, C.A.

Hoard Exploration Co. of Houston acquired 51% interest in the small Venezuelan independent firm from Cecil V. Hagen, Talon president until the time of sale. Hoard obtained the interest in exchange for several producing properties in Texas, Oklahoma, and Canada, plus an unspecified amount of cash.

Ralph Thomas, representative of the Hoard group, said in Venezuela that personnel and operations would be cut back immediately in order to put Talon on a profit-making basis.

Hoard exploration conducted a seismic survey for Talon last year in the company's fields in the state of Falcon, under the name of Nenseis, C.A.

Local stockholders had held an option on Hagen's interest in Talon. When this option expired, Hoard Exploration, owned by Joe Hoard and other Texas oil men, took out an option and followed through with the deal.

Talon is now producing 1,600 bbl. daily from its Falcon properties, down from a peak year of more than 2,500 bbl. daily in 1956.

The Venezuelan Government recently turned down a request by minority stockholders asking it to buy Hagen's interest and use Talon as the foundation for a national Venezuelan oil company (OGJ, July 7, p. 87).

Gas Field Grows

in Algeria. New well boosts reserves at Hassi R'Mel.

THE FRENCH have a sizable gas field in Algeria and no market for the gas unless it can be moved to Europe in some way.

Ste. Nationale de Recherche et d'Exploitation des Petroles en Algerie (SN Repal) has brought in its sixth gas well at Hassi R'Mel, 250 miles south of Algiers in the Sahara.

Armand Colot, SN Repal manager, recently estimated the gas reserves found at the field so far at almost 11 trillion cubic feet. This is just slightly less than a year's gas production in the United States, but it would equal 6 years of coal consumption in France.

At least two studies are under way to determine a feasible way to transport the gas to Europe (OGJ, May 26, p. 75).

Saharan oil . . . Colot also estimated that his company and Cie. Francaise des Petroles (Algerie) will produce more than 3 million barrels of oil in 1958 at Hassi Messaoud, the big Algerian oil field the two firms are developing. This would amount to an average of slightly more than 8,600 bbl. daily.

The two companies had produced more than 600,000 bbl. of oil from the field by mid-May and are moving more than 9,000 bbl. daily at the present time. The oil is transported to Touggourt by a 6-in. pipeline and then by rail car to the Mediterranean Coast at Philippeville. A 24-in. pipeline to link the field to the coast is now under construction.

Colot also revealed the companies are marketing the crude on long-term contracts for $21.40 to $22.60 a metric ton f.o.b. Bougie. This puts a $2.70 to $2.86 per barrel price tag on the Algerian crude.

Trade Deal Sought

by Japanese. Ships may be swapped for Indonesian oil.

THE JAPANESE may skirt around their foreign exchange problem with a barter deal for North Sumatran crude.

A Tokyo trading company is negotiating with the Indonesian Government with an offer of 66 coastal vessels in trade for $50 million worth of crude from Royal Dutch-Shell's old properties in North Sumatra.

Kinoshita & Co. has representatives in Djakarta, where talks are going on with Permina, the government oil agency.

Kinoshita has close ties with Maruzen Oil Co., which recently received a 13,250-bbl. trial shipment from Pangkalan Susu (OGJ, June 23, p. 89). It also has ties with Japan Steel & Tube Corp., which has a newly opened seamless tube mill. Both Maruzen and Japan Steel have shown a keen interest lately in Southeast Asian oil affairs.

The trading company wants to take delivery over a 5-year period. On the basis of the current f.o.b. price of $1.80 per barrel for North Sumatran crude, deliveries would average 14,400 bbl. daily.

Israel Completes Line

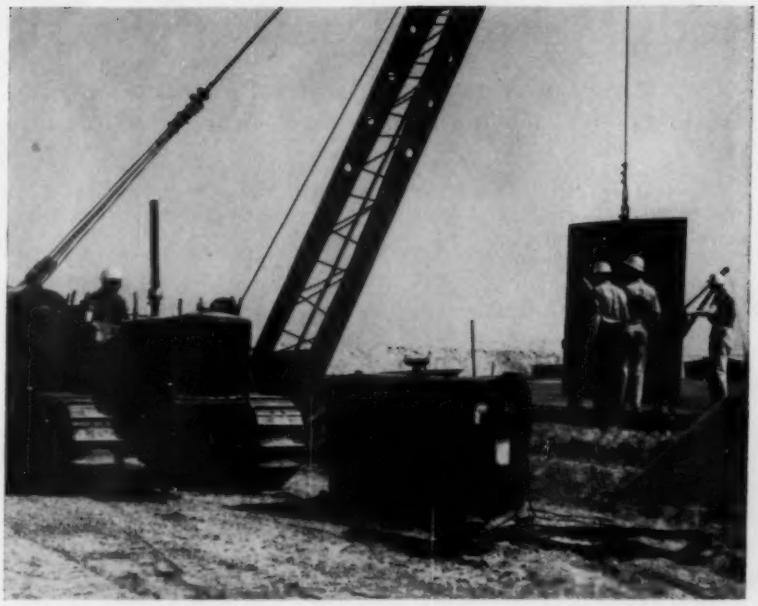
A PIPELINE system linking Israel's port of Eilat on the Gulf of Aqaba with the Haifa refinery will open by the end of July.

The final 90-mile, 16-in. section has been completed, and crude is expected to start flowing in a matter of days. The section runs northward along the Mediterranean Coast from Ashdod Yam to Haifa.

The government started the system soon after the Israeli invasion of Egypt in 1956, when an 8-in. line carrying up to 24,000 bbl. daily was laid from Eilat to Beersheba.

Crude at first was carried by truck and rail to Haifa until a 16-in. extension from Beersheba to Ashdod Yam was completed last year. Since then, crude has been taken by coastal tankers from Ashdod Yam to the refinery.

Israel is also toying with a proposal for a major 32-in. line from Eilat to Haifa, with a capacity of 500,000 bbl. daily.



Esso Starts Work on Dutch Refinery

A NEW REFINERY at Rotterdam will help Esso Nederland, N.V., meet the big growth in demand for petroleum products in Benelux countries.

Esso has started construction of the big plant and expects to have it on stream by 1960.

The project was first announced in 1956, with plans calling for capacity of 30,000 to 40,000 bbl. daily (OGJ, June 25, 1956, p. 82). This has been changed to 95,000 bbl. daily.

H. O. Horstmann, director of the Standard Oil Co. (N. J.) affiliate, explained that "in the past 10 years the demand for power in the Netherlands has been annually increased by 11%."

About a fifth of the crude will come from Dutch soil. Fifty per cent of the production of Netherlands Petroleum Co. (NAM) will be processed in the new plant. Jersey Standard has a 50% interest in NAM. The rest of the crude will be imported.

The refinery will supply the Dutch market and ocean-shipping bunkering in Dutch harbors, but a considerable part will be exported.

Bahama Block Goes to Canadian Firm

SIEBENS Leaseholds, Ltd., has acquired a 524,800-acre 2-year concession on Andros Island, the largest island in the Bahamas.

The company plans to form a Bahamian firm to carry out exploration on the concession which covers the north half of the island and some offshore acreage on the east side.

The new Siebens block is about 100 miles northeast of a 15,000-ft. wildcat being drilled at Cay Sal Bank in a joint venture by Standard Oil Co. of California and Gulf Oil Corp. The test is now drilling at about 9,000 ft.

Siebens said there has been one previous deep test drilled on Andros Island. The operator, Canadian Superior Oil of California, Ltd., abandoned the wildcat at about 11,000 ft. after losing drill pipe.

Siebens Leaseholds is a private company, the most recent of five Canadian oil firms formed in the past 10 years by Harold W. Siebens, Calgary oil man.

Reds Make Oil Deal with Brazil

. . . in busy drive for world markets, political influence. Crude oil now moving from Russia to Argentina, Uruguay.

AN OIL-FOR-COFFEE barter deal between Romania and Brazil has highlighted the stepped-up activity of Communist trades in western oil markets.

Brazil will get petroleum products and chemicals, exploration and oil-field equipment, and machine tools. Romania will take in trade coffee, vegetable oils, fibers, and cotton.

The bilateral agreement will run for a year, with a renegotiation clause. There is no limit on the amount of products that can move between the two countries, except the spread between the value of imports and exports cannot exceed $10 million.

The deal is pay dirt for Russian and Romanian traders who have been busier than ever before offering oil and oil equipment throughout most of the free world.

A check of Soviet progress shows that despite its small-scale influence on world-wide oil trade, Black Sea oil is getting its foot into many doors and has growing political implications.

Brazil has not been eager to do business with Iron Curtain countries. It has not had diplomatic relations with Russia for 10 years. But the offer by Romania to swap oil for coffee was too good to turn down in the face of a foreign exchange shortage and a surplus of home-grown products.

Other deals . . . Elsewhere in Latin America, the Soviets will supply 1,000,000 tons of crude to Argentina (about 7,000,000 bbl.) in the next 2 years.

By applying extremely low freight rates, the crude will be delivered at a price below market levels. The Russians also troubled themselves to put on an impressive exhibit at a recent Argentine oil fair.

Uruguay, the Latin American country most closely tied to Russia economically, will buy 1,250,000 bbl. of crude this year. Both Argentina and Uruguay will pay for most of the oil with shipments of wool, thus saving precious foreign exchange.

The Soviet deputy foreign minister of trade has made a special trip to Mexico to try to stir enthusiasm for Russian-manufactured products.

Iceland gets all its oil products except aviation gasoline from the Communists in exchange for fish. A large share of Finland's oil needs also are supplied from behind the Iron Curtain.

Tough sledding . . . Elsewhere in Europe, the Russians are having slower going.

Sweden is buying less oil because of higher than world prices and because of tiresome Red tape. Italy reduced shipments from the Reds after the reopening of the Suez Canal permitted resumption of normal supplies.

Trade between the Russians and Egypt has dropped off from last year, despite the large credits granted by the Soviets. Contrary to earlier reports, there is some doubt whether any Russian oil-field equipment has arrived in Egypt. Morocco has contracted for Soviet oil in a trade deal.

The Soviets have offered to carry on an exploration program in Syria at the option of the United Arab Republic. They already have programs under way in Afghanistan and India.

Future outlook . . . Russia may have spoiled some of its arguments for East-West deals in its recent dealings with Israel.

An Israeli trading company sued the Russians for more than $2 million it said it lost when oil shipments to Israel were arbitrarily cut off after Israel invaded Egypt. Another firm lost more than $7 million.

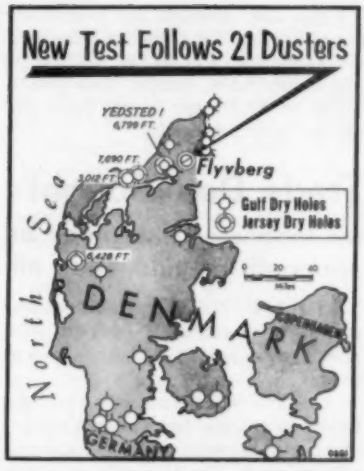
The Soviet arbitration panel rejected the test claim. As an after effect, several other countries which have agreed to submit any disputes to the Soviet panel are now reportedly wondering how impartial the decision might be.

Guiana Seismic Work Starts

CALIFORNIA Oil Co. (British Guiana), Ltd., has begun seismic work off the west coast of British Guiana on a 16,000-sq.-mile concession acquired last spring.

The newly formed company, subsidiary of Standard Oil Co. of California, awarded survey contract to Western Geophysical Co. of America. Two boats and about 20 technologists will be employed in the survey.

British Guiana borders on Venezuela and Brazil on the west. McBride Oil & Gas Corp. was the last company in the area, but it concentrated its exploration efforts in the eastern part of the colony (OGJ, Apr. 28, p. 74).



Danish Efforts Fail

to uncover oil, but Jersey tries again at new wildcat.

THE MOST recent efforts to coax oil from Denmark's northern Jutland Peninsula have so far been a disappointment.

Danish American Prospecting Co. (Jersey Standard) has just started its fifth Danish well after drilling four dry holes in little more than a year.

Kellogg Overseas Drilling Co. has moved its rig off Yedsted 1 after the hole was bottomed at 6,799 ft. and spudded in at Flyvberg about 10 miles to the east.

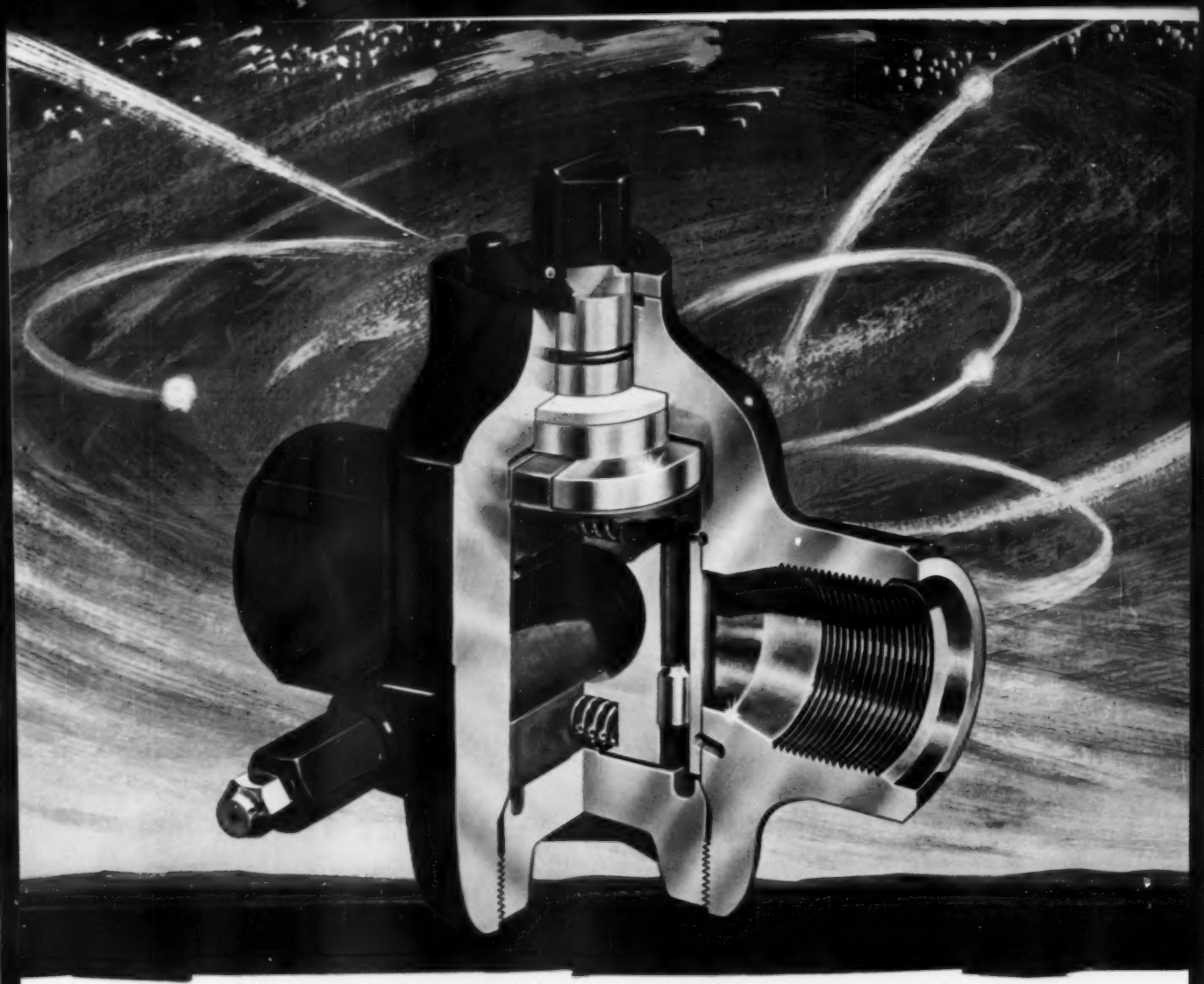
The Jersey affiliate hasn't had a show in any of the four tests it has drilled to date.

Gulf's campaign . . . Jersey took over the Denmark concession more than a year ago by acquiring the stock of Gulf Oil Corp.'s company, Danish American. Gulf reportedly spent more than $10 million in the country before giving up the search (OGJ, Mar. 18, 1957, p. 107).

Gulf originally obtained the concession over all Denmark's 16,576 sq. miles in 1938. It was originally a 50-year concession, but was renegotiated after World War II with a 1960 termination date. This has now been extended for 30 years.

DAPCO drilled 17 dry holes in Denmark under Gulf ownership, three of them below 10,000 ft. and at least six that would be considered deep tests. The country has long been regarded as a good prospect because a part of the North German basin extends into Jutland and some salt domes have been found.

The small Scandinavian country has no production and no refining of significance.



This valve is the Mission 2-inch figure 400 valve. See Mission catalog for complete listing of sizes and pressure ratings

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But that is not the whole story. Notice the Teflon combination thrust bearing and stem seal backed up by an "O"-Ring. This arrangement provides easy turning and positive sealing.

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With minimum care, Mission valves last indefinitely. They are also compact to fit into complex manifolds, and they are low in overall cost. They are offered in nearly all sizes and pressure ratings for production, cycling, injection, and certain refinery applications. For more information, contact your supply store, your well head manufacturer, or your Mission representative. The quicker you standardize on Mission Valves, the lower your overall valve costs will be.

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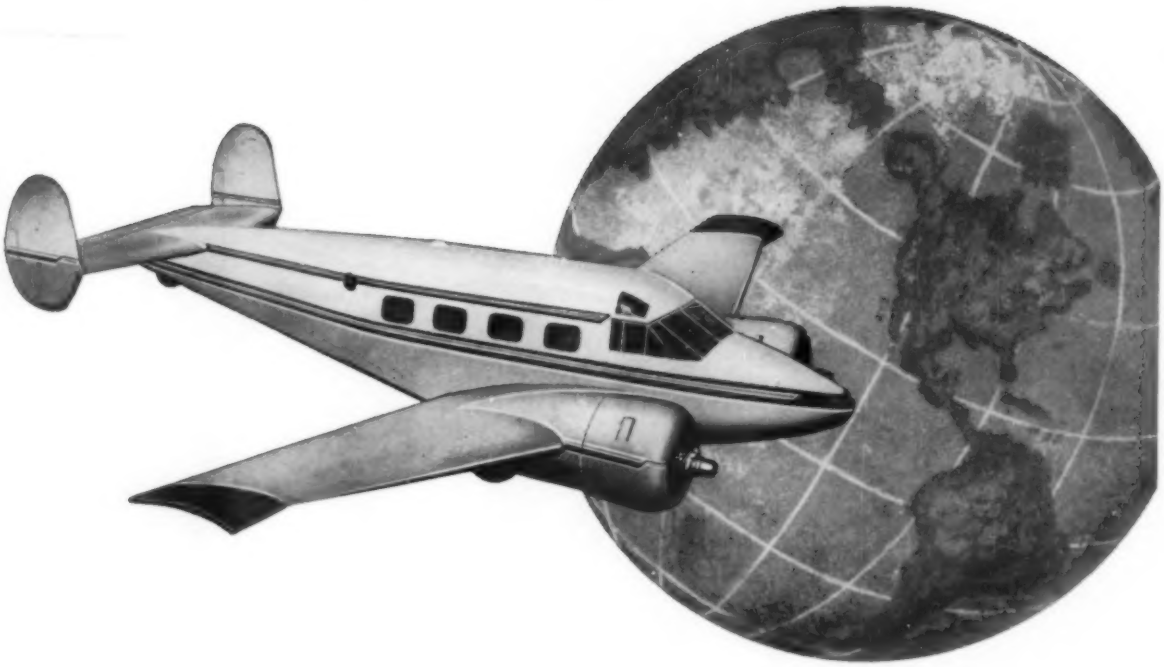

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BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Vapor recovery turns evaporation loss into a profit

A $40,000 investment pays out in less than 5 months

BY R. E. FIELDS
Atlantic Refining Co.

A SUBSTANTIAL stock-tank evaporation loss in the Block 31 field, Crane County, West Texas, has been eliminated by a vapor-recovery installation. The recovery system is an adjunct to centralized storage facilities recently installed in the field, which is a large unitized operation.

Total recovery of vapors for gasoline-plant processing is expected to reach 10,000 gal. per day when all operating kinks are ironed out. Additional annual income will then amount to more than $100,000, giving a payout of the $40,000 investment in less than 5 months.

Paper presented at API evaporation-loss committee meeting, Houston, 1958.

Requirements met . . . The Devonian production of Block 31 met all the requirements for a profitable vapor-recovery operation. First requisite is a storage facility where a large volume of crude is handled. Crudes expected to have substantial quantities of evaporation losses are those with high gravity and high vapor pressure.

To handle these vapors, storage facilities need to be centrally located for collection, as long gathering lines for low-pressure gas involve expensive, large-diameter pipe or extra compressor installation. At Atlantic Refining Co., the condensate from large gas facilities is produced through lease stabilizers before it is put into storage. This narrows the hunting down to the larger oil-field operations.

The drawback against doing something about the losses in Block 31 was the widely spaced storage facilities. Then, about 2 years ago, we noticed tank corrosion throughout the field. The necessary replacement of storage facilities set up a natural opportunity for vapor-loss control.

Block 31 Field

Block 31 is located in the sand and mesquite country in Crane County, West Texas, about 30 miles south of Odessa. It is a prolific oil field with several producing reservoirs. Principal production is from the Devonian formation, producing with the assistance of a gas-pressure maintenance program.

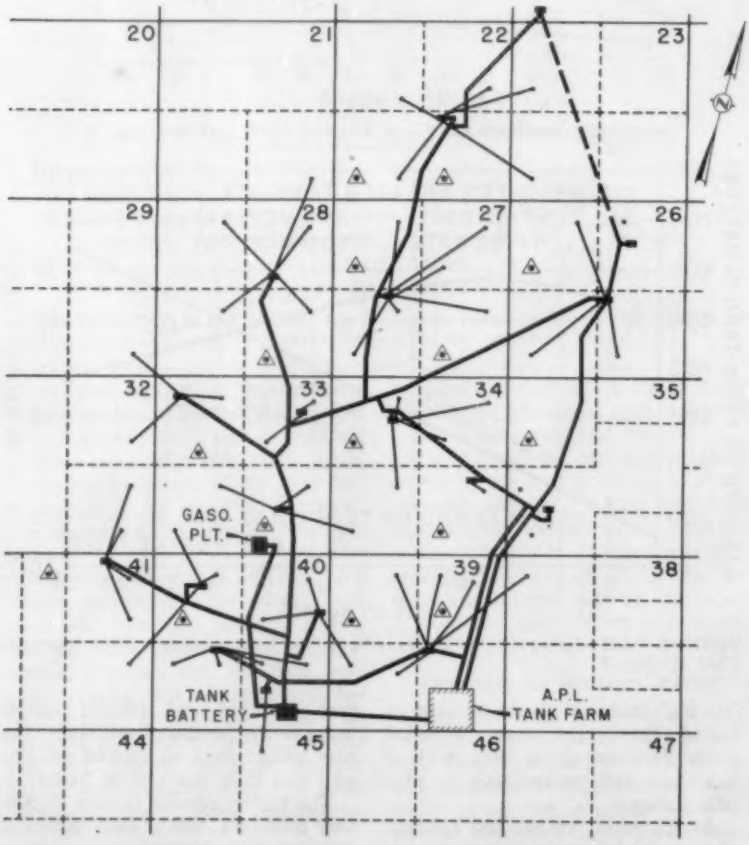
Only the Devonian production is concerned with vapor control. Production from other formations is kept in separate storage facilities, still widely spaced in the field.

The Devonian wells produce from a depth of about 9,000 ft. The average gas-oil ratio is 1,400 cu. ft. per barrel. API gravity runs 47° and the Reid vapor pressure is over 10 psi., even after stage separation and treating. With a full-pressure maintenance program, the producing rate is about 15,000 bbl. per day.

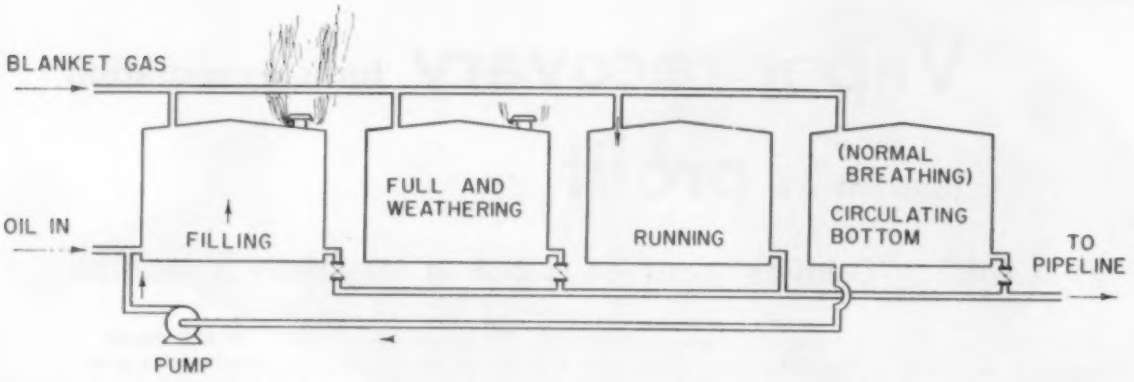
Block 31 is unitized with Atlantic the operator, so we were able to consider the whole field as a package.

The vapor-recovery opportunity . . . At the time of the study it looked as if all the Devonian tanks would need replacement within a year. Since there were 62 of them, and the reservoir is expected to produce for a long time, we considered this problem carefully. The estimated replacement cost of $270,000 was staggering, so we decided to investigate the possibilities for one large central tank battery.

If we could justify centralizing this storage we would then have the opportunity for vapor recovery. We con-



EXISTING FLOW LINES fortunately were adequate and could bring the crude to a central storage facility. Main expense was a large tank battery. Fig. 1.



NORMAL PRODUCTION ROUTINE at the storage battery. Automatically each tank is filled, weathered, run, and the bottom circulated. Fig. 2.

sidered using the flow lines and separation stations we had and laying an oil-gathering system to these separate stations.

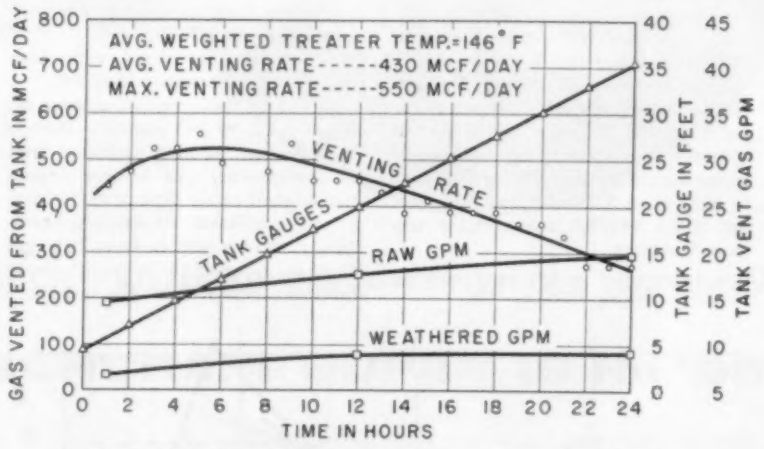
As we looked at field maps we realized the unique situation and saw that we already had everything needed except a large battery of tanks. Fig. 1 shows the separation stations at the original lease tank locations.

Gathering system . . . Because of the desirable composition of this particular crude for refinery processing, the pipeline company had a separate gathering system from the Devonian batteries to its terminal at the south side of the field. This allowed them to gather and deliver Devonian oil without mixing with other oil. We then arranged to buy this gathering system and produce directly into it from our treaters and separators.

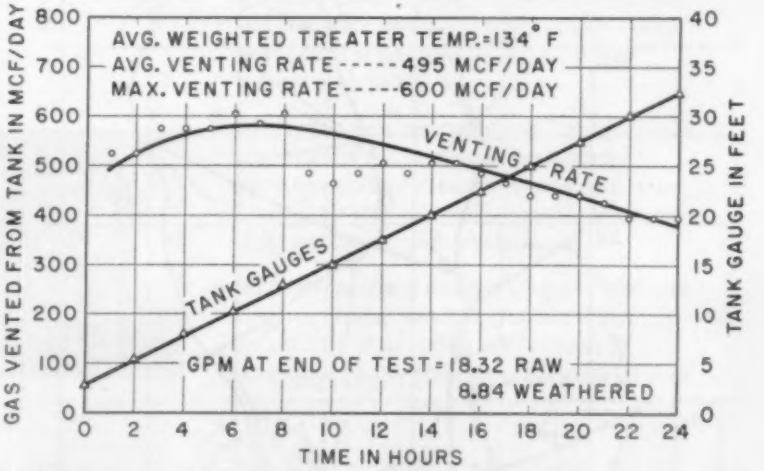
Only slight revision of the gathering system was necessary. The pipeline company had to lay a new section of line to serve three operators not in the unit, and we had to extend a section of line to one location.

We found ourselves ideally situated to dispose of the vapors, too. The pressure-maintenance plant is less than a mile from the central battery location. The plant was being enlarged to include full gasoline-plant facilities and was scheduled for completion a little before we could be ready to collect vapors.

Compared with replacing and maintaining tanks in their original locations throughout the life of the field, the central tank battery had a present-worth advantage of over $100,000.



MAXIMUM VENTING RATE was 550,000 cu. ft. per day. Fig. 3.

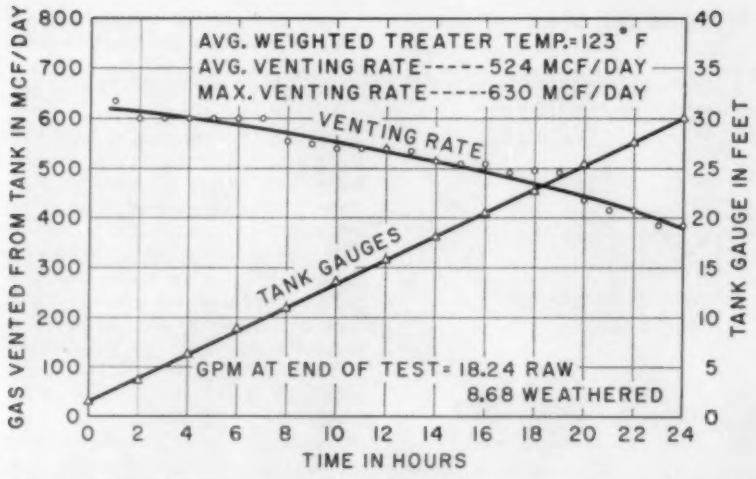


VENTING RATE during filling cycles where the treater temperature averages 134° F. Fig. 4.

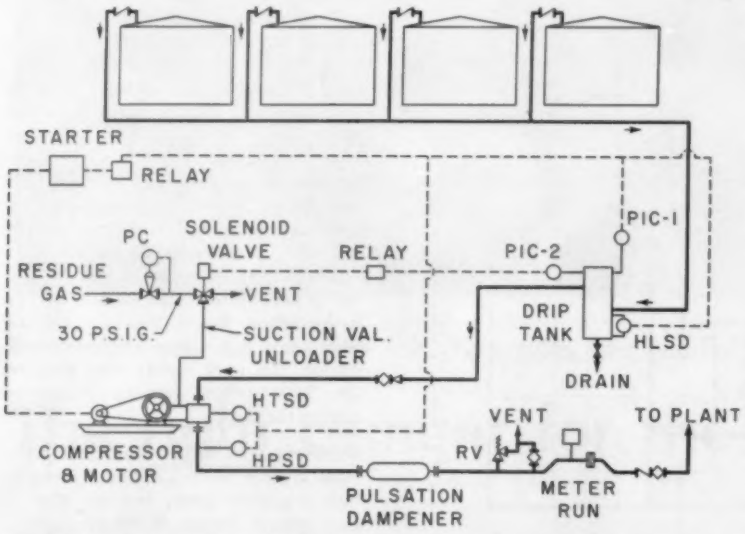
Flow considerations . . . We had to make sure that we would be able to flow into the central battery with the available operating pressure of the treaters and head due to the location of the separation stations. Levels were run and we found we had adequate head to overcome friction and flow into high tanks. With the tankage removed from each lease, metering would be necessary to keep track of individual well performance by periodic testing.

At this point, we had just concluded some trial metering installations in Block 31 and we found we could expect accurate and reliable testing using meters instead of test tanks. The plan looked good, so we took the first step and built the central battery.

The battery consists of four 20,000-bbl. cone-roof tanks, each equipped with two 6-in. pressure-vacuum emergency vents. These vents are weight-



TREATER TEMPERATURE averages 123° F. Note that the greatest venting rate occurs at the lowest liquid levels. Fig. 5.



VAPOR-RECOVERY INSTALLATION has automatic shutdown controls in case of too-low suction pressure or high liquid level in the scrubber. Fig. 6.

ed to open at 1.15 oz. pressure and 0.43 oz. vacuum. Blanket gas is taken from a plant residue line to separate pressure regulators for each tank. These regulators are of the large-diaphragm type for sensitive operation. For blanketing, we hold about ½-oz. pressure.

For the convenience of our producing personnel, the tanks are equipped with ground-level gaging and sampling devices. The pipeline insists, however, that for their purposes, gaging and sampling still has to be done through the deck. To maintain gas-blanket pressure and not lose any vapors, we have gastight gaging and sampling heads so these operations can be done under pressure.

Pipeline also insists on running a Tulsa thief through the deck. For this we have a simple hatch and a 20-ft. down pipe. The down pipe maintains a seal against the tank pressure.

Fig. 2 shows the normal production routine at the storage battery as it was operated initially. Alternately each tank is filled, weathered, run, and the bottom circulated. Production is continuous at the rate of 15,000 bbl. per day. The greatest part of the vapor is from the tanks filling and weathering.

Designing the Recovery System

The Devonian oil flows through emulsion treaters before going to storage. Gas from emulsion treaters as well as from the tanks would eventually reach the gasoline plant. It seemed logical to hold treater temperatures high to drive off most of the lighter ends where we already had gathering and compression facilities. Any liquid in the gathering system is discharged from the plant inlet scrubber to a slop-oil tank and is charged back against lease allowable.

We didn't want to drive anything off the treaters that would go in the slop-oil tank. By checking dew points of the treater gas, we found that highest treater temperatures obtainable were O. K. from this standpoint.

Maximum venting rate (Fig. 3) was 550 M.c.f. per day, while the greatest daily average rate was 430 M.c.f. at 146° F. treater temperature. Average Reid vapor pressure in the tanks was about 10.3. Tank vapors were sampled and analysis showed the content to increase from 14.8 g.p.m. (raw) to 19.72 g.p.m. as the tank was filled.

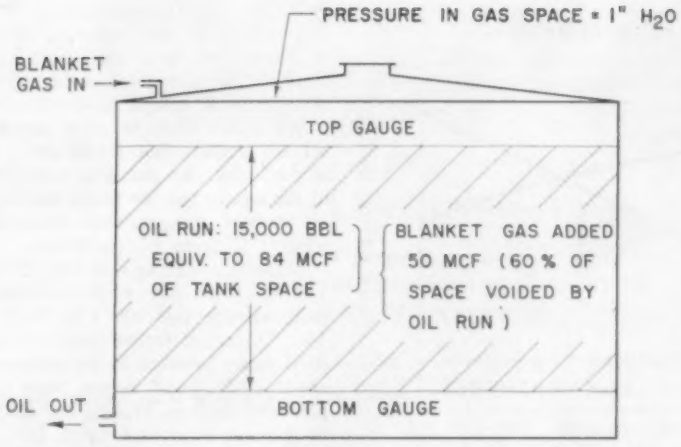
Figs. 4 and 5 show venting rates during filling cycles where treater temperatures average 134° F. and 123° F. respectively. Note that the greatest venting rate occurs at the lowest liquid levels when more complete flashing is occurring. Standing losses were estimated at about 10% of our measured filling losses, using available published curves and nomographs on storage losses.

Vented gas was measured during filling with three 4-in. orifice well testers. These were installed in couplings welded in the plate in the tank deck. Gas was vented to atmosphere and pressures were taken on a low-pressure recorder. The pressure recorder was checked periodically against a water monometer to insure accurate chart interpretation.

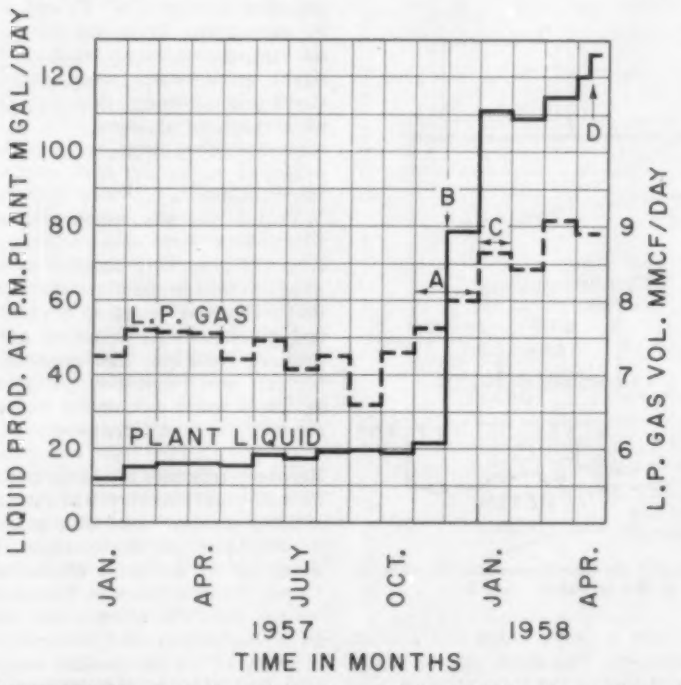
Recovery estimates . . . Expected additional plant recovery was estimated at $290 per day, based on a pessimistic 400 M.c.f. per day of vapor. This would be the net value of additional 12 psi. gasoline, propane, butane, and residue gas. The estimate was based on a Podbielniak analysis and plant recovery of all the gasoline and butane and 85% of the propane. Recovery equipment cost less than $40,000 with a payout of less than 5 months. Additional annual income would be over $100,000.

The installation was made as shown in Fig. 6. Piping from each tank manifolds to a 15 by 9-in. single-stage, double-acting compressor, driven by a 50-hp. electric motor. Suction is at slightly over atmospheric pressure and discharge is at 10 psig. into an existing 6-in. gathering line 200 ft. away.

The compressor is equipped with a suction-valve unloader on one end to compensate for low suction pressure when gas volumes decline during changing climatic effects on the tanks. There are also automatic shutdown controls in case of too-low suction


PRESSURE IN GAS SPACE = 1" H_2O
BLANKET GAS IN
TOP GAUGE
OIL RUN: 15,000 BBL EQUIV. TO 84 MCF OF TANK SPACE
BLANKET GAS ADDED 50 MCF (60 % OF SPACE VOIDED BY OIL RUN)
OIL OUT
BOTTOM GAUGE

COMPARISON between volume of input blanket gas and space voided when a tank was run revealed that injected gas amounted to only 60% of volume of oil run. Fig. 7.



PLANT RECOVERY eventually will be increased by 10,000 gal. per day using the newly installed vapor-recovery system. This represents an addition to annual income from the property of $100,000. Fig. 8.

pressure or high liquid level in the scrubber.

We compared the volume of input blanket gas with the space voided when a tank was run. As illustrated in Fig. 7, the volume of blanket-gas injected amounted to only 60% of the volume of oil run. The extra 40%, then, must have come from evaporation. To take advantage of this and still have simple compressor control, check plates were installed in the tank vapor lines to prevent vapor back flow.

The check plates serve as check valves, yet they are inexpensive, light and have a light semibalanced clapper. The clapper of the normal swing-check valve weighs about 30 lb. and might have caused excessive pressure drop in the line.

Battery Operation

The compressor was started and the vapors were placed on stream with very little difficulty. The compressor controls were set after a little experimenting within the narrow pressure ranges available. Blanket gas regulators were set to maintain a minimum of 0.3 in. of water pressure on the tanks.

Both ends of the compressor cylinder take suction until suction pressure pulls down to 0.6 in. of water, at which time the intake valve on one end is pneumatically opened. The compressor then operates at about half the capacity until the suction pressure builds back to 1.2 in., when it again starts compressing at both ends of the cylinder.

If the suction pressure declines to as low as 0.4 in. of water, the compressor stops until the pressure builds back up. At 0.8 in. of water the compressor automatically starts again.

The only disappointment was in the operation of the check plates in the tank vapor lines. Whenever the compressor operated with one suction valve open, pulsation in the suction line caused the check plates to clatter violently from full open to full closed.

This leaves a choice of either operating without the check valves or changing to a bypass-type compressor-control system. The system will be operated for a month or two with the plates propped open. Then another type compressor control will need to be used so we can evaluate the difference in liquid recovery with the tanks operating both with and without individual tank vapor control.

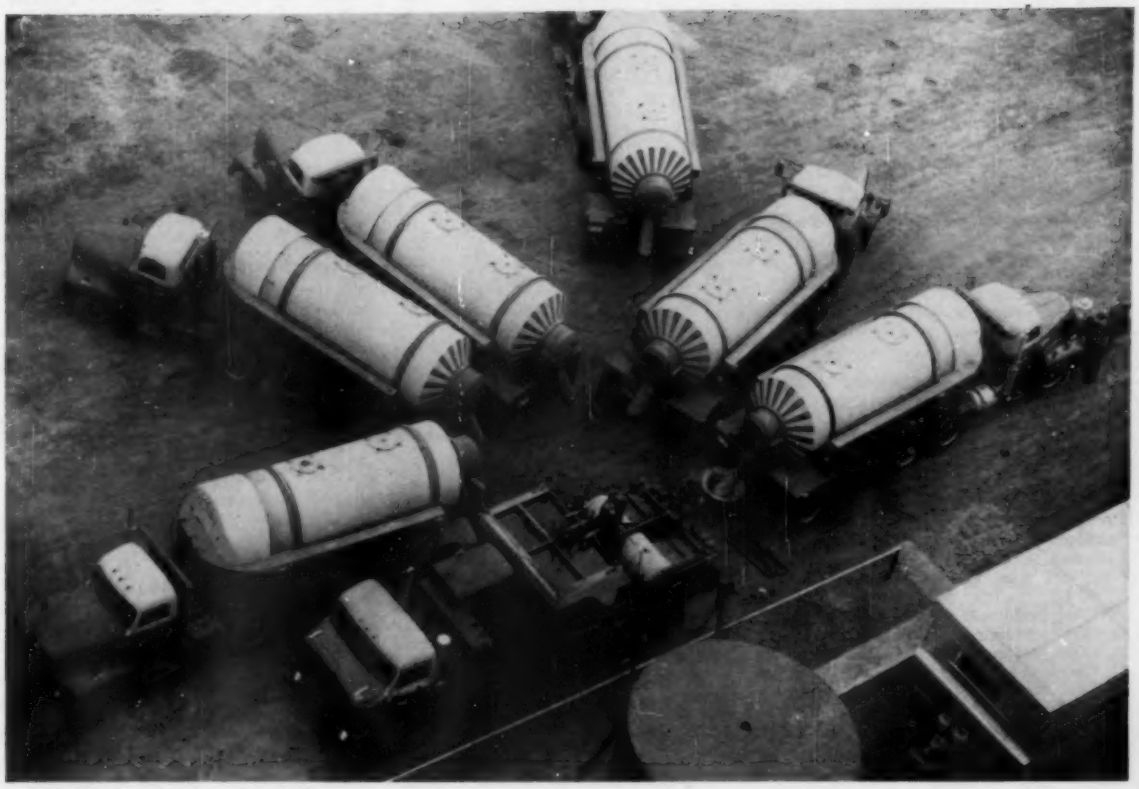
The vapor compressor inlet scrubber is accumulating about 100 gal. of hydrocarbon liquid and 20 gal. of water per day. This condenses out during the cool nights and part of the hydrocarbon liquid revaporizes during the day.

Recovery . . . While these few problems involve some additional thought, half a million cubic feet per day of rich gas is being delivered.

Fig. 8 is a graph of the total plant liquid recovery, showing average daily recovery by months. Since the plant process was changed during this period (point B) the plot of the low-pressure gas volumes at the plant is a little more indicative of the effect of treater preheating (point A) and insulating (point C). This extra heat at the treaters became necessary to control stock-tank vapor pressure during the winter months. Tank vapors reached the plant beginning at point D in Fig. 8.

References

1. "Petroleum Tankage and Transmission," 19, Graver Tank & Manufacturing Co.
2. "The Petroleum Engineer's Continuous Tables," 640.141 (1942), chart by Chicago Bridge & Iron Co.
3. "Engineering Data Book," 137 (1957), Natural Gasoline Supply Men's Association.
4. "Conservation in Petroleum Storage," No. W-10, 7, 12, 36, Donald E. Larson.
5. "Varec Technical Bulletin CP-1001," 6, 9 (1955), Vapor Recovery Systems Co.



For well-cementing jobs like this, firm rules are needed in choosing . . .

The right cement for the right job

Here is a set of physical and chemical requirements constituted specifically to cover those properties needed in the cementing of oil and gas wells. It not only fulfills the need for a practical specification, but it also furnishes a method of classifying and identifying portland cements in terms related to their use in well-cementing operations.

BY B. E. MORGAN
Humble Oil & Refinery Co.

THE NEED has been recognized since the early use of portland cements in oil and gas wells for a specification covering those properties which affect the performance of cements under well-cementing conditions.

Use of the API specification by those who manufacture, distribute, and purchase cements for use in oil and gas wells is desirable for several reasons. It furnishes the manufacturer a list of properties needed in the cementing of wells under specified conditions. It assures the purchaser that the cements meet certain minimum requirements. It simplifies communication about the classification and identification of portland cements for use in the cementing of wells.

These specifications must be used by all who are concerned with the cementing of oil and gas wells. This will accomplish the maximum benefits. Several cement manufacturers are willing to use these specifications. The usefulness of the specification is limited at the present time, however, because purchasers are not requesting oil-well cements in accordance with the API system of classification and specification.

The effectiveness of the specification in the future depends to a great extent upon recognition by the purchaser of the benefits afforded by the system. It is hoped that the purchasers will recognize these benefits and begin to use the API system of classification and specification for oil-well cements.

Portland cement is a hydraulic product made by burning and grinding a mixture of calcareous and argillaceous materials, such as limestone and clay, limestone and shale, limestone

This paper was presented at the spring meeting of the southern district, division of production, API, in Houston, Tex., in February 1958, under the original title: "API Specification For Oil-Well Cements."

TABLE 1—PHYSICAL REQUIREMENTS FOR SEVEN CLASSES OF OIL-WELL CEMENTS

Description of test	RP 10B schedule no.	Simulated depth, ft.	Initial viscosity‖	Class A	Class B	Class C	Class N	Class D	Class E	Class F
				Minimum thickening time, min.						
Pressure-temperature thickening time*	1	1,000	30 poises	80	80	80	..	..	..	..
Pressure-temperature thickening time*	4	6,000	30 poises	80	80	80	80	80	80	..
Pressure-temperature thickening time*	5A	9,000	30 poises	..	..	..	80	..	..	..
Pressure-temperature thickening time*	6	10,000	30 poises	..	..	..	..	..	80	80
Pressure-temperature thickening time*	7	12,000	30 poises	..	..	..	..	82	..	..
Pressure-temperature thickening time*	8	14,000	30 poises	..	..	..	..	..	92	..
Pressure-temperature thickening time*	9	16,000	30 poises	..	..	..	..	..	..	102
	Test temp., °F									
Atmospheric pressure thickening time A†	80-140	....	25 poises	80	80	80	130	195	..	..
Atmospheric pressure thickening time B‡	80-140	....	8 ounces	110	110	110	120	180	..	..
	Curing temp., °F	Curing time, hr.		Minimum compressive strength, psi.						
Strength development	100	8	.....	250	200	300	..	..	..	..
Strength development	100	24	.....	1,800	1,500	2,000	..	..	..	..
Strength development	140	8	.....	..	..	..	800	..	..	..
Strength development	140	24	.....	..	..	..	3,000	..	..	..
	RP 10B schedule no.	Simulated depth, ft.	Curing time, hr.							
Strength development	7S	12,000	8	..	..	..	..	500	..	..
Strength development	7S	12,000	24	..	..	..	..	2,000	..	..
Strength development	4S	6,000	24	..	..	..	..	1,000	1,000	..
Strength development	8S	14,000	8	..	..	..	..	..	500	..
Strength development	8S	14,000	24	..	..	..	..	..	2,000	..
Strength development	9S	16,000	8	..	..	..	..	..	..	500
Strength development	9S	16,000	24	..	..	..	..	..	..	1,000
Strength development	6S	10,000	24	..	..	..	..	..	..	1,000
Soundness¶ (autoclave expansion), max. %				0.50	0.50	0.50	0.50	0.50	0.50	0.50
Fineness§ (specific surface), min., sq. cm. per g.				1,500	1,600	2,200	..	..	..	..

*Test performed in Pan American thickening-time tester.
†Test performed in Halliburton thickening-time tester.
‡Test performed in Standard of California thickening-time tester.
¶As described by ASTM C C 189: "Standard Method of Test for Soundness of Hydraulic Cement over Boiling Water (Pat Test)."
§As determined by Wagner turbidimeter apparatus, described in ASTM C 115: "Method of Test for Fineness of Portland Cement by the Turbidimeter."
‖Maximum reading during the 15-30-minute stirring period.

and marl, chalk, and clay, or limestone and iron blast-furnace slag. Although portland cement is primarily a construction product, is is used extensively also in oil-well cementing operations.

Test procedures and specifications for the performance of various types of portland cement in construction work are maintained by the American Society for Testing Materials (ASTM). ASTM tests are inadequate for determining the performance of cements in wells because they are made under conditions dissimilar to those encountered in oil-well cementing operations.

The literature reveals that this fact has been recognized since the early use of portland cements in wells. As long as 30 years ago the need was expressed for an API specification for oil-well cements, but the only standardized tests available at that time were those designed for the construction industry by ASTM.

In November 1950, the central committee on standardization of oilfield equipment authorized the organization of a committee on standardization of oil-well cements and charged it with the maintenance of the test procedures and the development of specifications. The first edition of "API Specification for Oil-well Cements" was dated March 1953. Changes have been made as they were needed in both the test procedures and the specification to keep the latest and best information available.

The latest revision of the test procedures is now available in the publication, API RP 10B: "Recommended Practice for Testing Oil-well Cements 7th Ed.," January 1958. The latest revision of the specification is available in the publication API Std. 10A: "API Specification for Oil-well Cements, 5th Edition," January 1958. Copies of both API RP 10B and API Std. 10A are available from the API, 300 Corrigan Tower Building, Dallas 1.

Because there are several types of portland cement, an API system of classification is used in the specification. The system provides for seven classes in regular and high sulfate-resistant types, as follows:

Class A: Intended for use from surface to 6,000-ft. depth, when special properties are not required. Available in regular type only (similar to ASTM C 150, Type I).

Class B: Intended for use from surface to 6,000-ft. depth. Available in regular type (similar to ASTM C 150, Type II) for conditions requiring moderate sulfate resistance, and in the high-sulfate-resistant type.

Class C: Intended for use from surface to 6,000-ft. depth, for conditions requiring high early strength. Available in the regular type (similar to ASTM C 150, Type III), and in the high-sulfate-resistant type.

Class N: Intended for use from 6,000 to 9,000-ft. depth, for conditions of moderate temperature and pressure. Available in the regular type (having moderate sulfate resistance), and in the high-sulfate-resistant type.

Class D: Intended for use from 6,000 to 12,000-ft. depth, for conditions of moderately high temperature and moderately high pressure. Available in the regular type (having moderate sulfate resistance), and in the high-sulfate-resistant type.

Class E: Intended for use from 6,000 to 14,000-ft. depth, for conditions of high temperature and high pressure. Available in the regular type (having moderate sulfate resistance), and in the high-sulfate-resistant type.

Class F: Intended for use from 10,000 to 16,000-ft. depth, for conditions of extremely high temperature and extremely high pressure. Available in regular type (having moderate sulfate resistance), and in the high-sulfate-resistant type.

The basis for the classification outlined above is the pressure-tempera-

TABLE 2—CHEMICAL REQUIREMENTS FOR SEVEN CLASSES OF OIL-WELL CEMENTS

Regular Type	Class A	Class B	Class C	Classes N,D,E,F
Magnesium oxide (MgO), max., %	5.00	5.00	5.00	5.00
Sulfur trioxide (SO_3), max., %*	3.00	2.50	3.00	2.50
Loss on ignition, max., %	3.00	3.00	3.00	3.00
Insolube residue, max., %	0.75	0.75	0.75	0.75
Tricalcium aluminate ($3CaO \cdot Al_2O_3$), max., %†	....	8.00	15.00	8.00
High-Sulfate-Resistant Type				
Magnesium oxide (MgO), max., %	....	5.00	5.00	5.00
Sulfur trioxide (SO_3), max., %	....	2.50	3.00	2.50
Loss on ignition, max., %	....	3.00	3.00	3.00
Insoluble residue, max., %	....	0.75	0.75	0.75
Tricalcium aluminate ($3CaO \cdot Al_2O_3$), max., %†	....	3.00	3.00	3.00
Tetracalcium aluminoferrite ($4CaO \cdot Al_2O_3 \cdot Fe_2O_3$) plus twice the tricalcium aluminate ($3CaO \cdot Al_2O_3$), max., %†	....	24.00	24.00	24.00

*When the C_3A content of Class A cement is 8% or less, the maximum SO_3 content is 2.50%.

†When the ratio of the percentages of Al_2O_3 to Fe_2O_3 is 0.64 or less, the tricalcium aluminate content is zero. When this ratio is greater than 0.64, the tricalcium aluminate content (expressed as C_3A) shall be calculated by the formula:

$$C_3A = 2.65 \times \% \ Al_2O_3 - 1.69 \times \% \ Fe_2O_3.$$

When this ratio is 0.64 or greater, the tetracalcium aluminoferrite content (expressed as C_4AF) shall be calculated by the formula:

$$C_4AF = 3.04 \times \% \ Fe_2O_3.$$

When this ratio is less than 0.64, an iron-alumina-calcium solid solution (expressed as ss ($C_4AF + C_2F$) is formed, the content of which shall be calculated by the following formula. The content so determined shall conform to the maximum limit specified in Table 1 for $C_4AF + 2C_3A$.

$$ss(C_4AF + C_2F) = 2.1 \times \% \ Al_2O_3 + 1.7 \times \% \ Fe_2O_3.$$

ture thickening-time test procedure given in API RP 10B. The depth limits are based on the conditions imposed by the casing-cementing well-simulation schedules. These schedules simulate the average conditions of temperature and pressure encountered at specified depths in the primary cementing of casing in wells. They form a system of classification which provides a basis for comparing the properties of cements under specified test conditions.

Inasmuch as the system is based on an average of the temperatures and pressures encountered at given well depths in casing-cementing operations, it does not necessarily define the practical limit for any specific field operation. This point needs to be emphasized because well temperatures and pressures vary considerably from one area to another.

For example, the temperature and pressure at a given depth usually are lower in the West Texas area than they are in the Gulf Coast area. Also, casing-cementing conditions usually are less severe than squeeze-cementing conditions. Recognition of these possible differences between the rigid test conditions of the API classification according to depth and the specific conditions for a given field job is important in the proper understanding and application of the API specification.

The API specification for oil-well cements covers several physical and chemical properties for each class. The tests used to evaluate these properties are given in detail in API RP 10B. To establish the relationship between these tests and the specification requirements, the test equipment and procedures are reviewed briefly as a part of the discussion on each physical and chemical requirement.

Physical requirements . . . The physical properties of viscosity, thickening time, and strength are of primary consideration in the cementing of oil and gas wells. The viscosity and thickening time must receive first attention because obviously a cement cannot be used if it fails to produce a slurry that remains pumpable long enough to be placed in the well. The strength property is important because it is desirable to keep to a minimum the time of waiting on the cement to set after it is in place. The present specification requirements for these properties and for soundness and fineness are presented in Table 1. Each requirement is discussed after the test used to evaluate the property is reviewed.

Viscosity and thickening time . . . Three thickening-time testers, Standard Oil Co. of California, Halliburton Oil Well Cementing Co., and Pan American Petroleum Corp., are described in API RP 10B for measurement of the viscosity and the thickening time of cement slurries. Each utilizes a paddle arrangement which stirs the cement slurry and indicates the resistance to the movement of the paddle through the slurry. The Standard Oil of California and the Halliburton thickening-time testers operate only at atmospheric pressure and temperatures up to 200° F.

The Pan American thickening-time tester can be operated with pressures up to 20,000 psi. and temperatures up to 400° F. The application of results obtained with the Standard Oil of California and the Halliburton thickening-time testers to predict the performance of cements in wells is subject to question, especially for deep, high-temperature cementing jobs, because the conditions of pressure and temperature encountered in wells are not simulated. This limitation is overcome with the Pan American thickening-time tester.

Use of the Pan American thickening-time tester and the pressure-temperature thickening-time test procedures described in API RP 10B provides a way to measure the thickening time of cement slurries under conditions of temperature and pressure similar to those encountered in actual cementing operations.

In these test procedures, schedules are provided for increasing the temperature and pressure with time to simulate "normal" conditions encountered in the cementing of wells at depths ranging from 1,000 to 18,000 ft. These "normal" conditions are considered to be the best average of the field data available to the API group. A complete review of these test schedules is available in a paper published in 1951.[1]

The viscosity of a cement slurry is an indication of the ease with which the slurry can be mixed and pumped. To provide reasonable control of this property, the specification stipulates for each class of cement a maximum viscosity reading of 30 poises in the Pan American thickening-time tester during the 15 to 30-minute stirring period. In the Halliburton thickening-time tester the maximum is 25 poises, and in the Standard Oil of California thickening-time tester the maximum is 8 oz.

The thickening time of a cement slurry is a measurement of how long the slurry remains pumpable under certain test conditions. The requirements greater than 80 minutes with the pressure-temperature thickening-time test are based on calculations of the time required to perform a casing-cementing job under typical field conditions.

The 82-minute value for Class D,

TABLE 3—API CLASSIFICATION OF PORTLAND CEMENTS MARKETED BY MANUFACTURERS AUTHORIZED TO USE THE API MONOGRAM*

API class	Depth, ft†	Trade name	Manufacturer
A	0-6,000	Dyckerhoff Halliburton	Dyckerhoff Portland-Zementwerke AG
A	0-6,000	Shell Brand Regular Portland	Halliburton Portland Cement Co.
A	0-6,000	Ideal Portland Cement	Ideal Cement Co.
A	0-6,000	Lehigh Portland Cement	Lehigh Portland Cement Co.
A	0-6,000	Longhorn	Longhorn Portland Cement Co.
A	0-6,000	Permanent Portland Cement	Permanente Cement Co.
A	0-6,000	El Toro Portland Cement	Southwestern Portland Cement Co.
A	0-6,000	Victor Portland Cement	Southwestern Portland Cement Co.
A	0-6,000	Atlas Standard Portland	Universal Atlas Cement Co.
B	0 6,000	Colton Regular Construction	California Portland Cement Co.
B	0 6,000	Ideal Portland Cement	Ideal Cement Co.
B	0 6,000	Lehigh Portland Cement	Lehigh Portland Cement Co.
B	0 6,000	Permanente Portland Cement	Permanente Cement Co.
B	0 6,000	El Toro Portland Cement	Southwestern Portland Cement Co.
B	0 6,000	Victor Portland Cement	Southwestern Portland Cement Co.
C	0-6,000	Ideal Portland Cement	Ideal Cement Co.
C	0-6,000	Lehigh Early Strength Portland Cement	Lehigh Portland Cement Co.
C	0-6,000	Permanente Portland Cement	Permanente Cement Co.
C	0-6,000	El Toro Portland Cement	Southwestern Portland Cement Co.
C	0-6,000	Victor Portland Cement	Southwestern Portland Cement Co.
C	0-6,000	Atlas High Early	Universal Atlas Cement Co.
N-SR‡	6,000-9,000	Dyckerhoff Halliburton Sulfate-Resistant Retarded Oil-Well Cement	Dyckerhoff Portland-Zementwerke AG
N	6,000-9,000	Modified Oil Well	Permanente Cement Co.
N	6,000-9,000	Victor "Class N" Oil-Well Cement	Southwestern Portland Cement Co.
D	6,000-12,000	Slow Colton Oil Well	California Portland Cement Co.
D	6,000-12,000	Ideal Slo-Set Cement	Ideal Cement Co.
D	6,000-12,000	High Temp	Permanente Cement Co.
D	6,000-12,000	Victor Class D Oil-Well Cement	Southwestern Portland Cement Co.
D	6,000-12,000	Atlas Unaflo	Universal Atlas Cement Co.
E	6,000-14,000	High Temperature Oil Well	California Portland Cement Co.
E-SR‡	6,000-14,000	Dyckerhoff Halliburton Sulfate-Resistant Retarded Oil-Well Cement	Dyckerhoff Portland-Zementwerke AG
E	6,000-14,000	Shell Brand High-Temp Oil-Well Cement	Halliburton Portland Cement Co.
E	6,000-14,000	Slow Set	Longhorn Portland Cement Co.
E	6,000-14,000	High Temp	Permanente Cement Co.
E	6,000-14,000	Victor Class E Oil-Well Cement	Southwestern Portland Cement Co.
E	6,000-14,000	Atlas Unaflo	Universal Atlas Cement Co.
F	10,000-16,000	Permatemp	Permanente Cement Co.

*Effective January 1, 1958.
†These depth limits are based on conditions imposed by the casing-cementing well-simulation tests (Schedules 1-9, incl., API RP 10B), and should be considered as approximate values.
‡Conforms to chemical requirements for high-sulfate-resistant type.

the 92-minute value for Class E, and the 102-minute value for Class F represent the calculated times required to mix and pump to depths of 12,000 ft., 14,000 ft., and 16,000 ft., respectively, 500 sacks of neat cement slurry in a casing-cementing job when the mixing rate is 20 sacks per minute and the displacement rate is 50 cu. ft. per minute in 7-in., 17-lb. casing.

Similar calculations for depths of less than 12,000 ft. give times of less than 80 minute, but a minimum requirement of 80 minutes is maintained for each class. With both of the atmospheric pressure thickening-time tests, the required times are based on two considerations. One is that experience which has been gained over a number of years by observing the laboratory tests and the field performance of cements.

The other is based on a fairly satisfactory correlation between pressure-temperature thickening-time tests and atmospheric pressure thickening-time tests for cements of Classes A, B, C, N, and D. Because the attempted correlation for Class E cement is very poor and correlative information is not available for Class F cement, atmospheric - pressure thickening - time values are not stipulated for Classes E and F.

Strength development . . . Two procedures for testing strength are described in API RP 10B. One procedure provides that the test specimens be cured under water at temperatures up to 180° F. and at atmospheric pressure. In the other procedure, the test specimens, submerged in water, are subjected to pressure and the temperature is raised in a manner to simulate average temperatures encountered in the cementing of wells at depths ranging from 1,000 to 18,000 ft. In both procedures, the compressive strength of the specimens is measured at the end of 8 and 24 hours. A complete review of the development of these test schedules is available in a paper published in 1954.[2]

A minimum strength at 8 hours is specified to assure that the cement sets quickly, and a minimum strength at 24 hours is specified to assure that the quality of the cement is satisfac-

tory. Before the strength values were selected, the API subcommittee on specification reviewed strength data on several cements representative of each class. The present strength values in API Std. 10A are not as high as a few subcommittee members desire them to be. However, the majority of the subcommittee considers the values to be high enough to assure satisfactory performance of the cements in field operations.

Soundness and fineness . . . The pyhsical properties of soundness and fineness are tested in accordance with procedures provided by ASTM. The soundness test detects the presence of undesirable materials which cause a cement to disintegrate internally by an uncontrolled expansive action. The fineness test indicates the surface area of a cement.

The specification on soundness is the same as that specified by ASTM. It is considered to be adequate to assure that the cement is of satisfactory quality. The fineness values for API Classes A, B, and C are the same as those for ASTM Types I, II, and III, respectively. Fineness values are not required at present for Classes N, D, E, and F because it is believed that limits might be unduly restrictive in the manufacture of these special oil-well cements.

Chemical requirements . . . ASTM procedures are used for the chemical tests. They include determinations for magnesium oxide, sulfur trioxide, calcium oxide, aluminum oxide, ferric oxide, loss on ignition, and insoluble residue. They are selected to furnish information so that a maximum limit can be placed on the amount of objectionable and inert materials in the finished product.

In API Std. 10A, portland cement is defined as the product obtained by grinding clinker, consisting essentially of hydraulic calcium silicates, to which no additions, other than suitable set-modifying agents, have been interground or blended during manufacture. (A suitable set-modifying agent is defined as one which has no deleterious effect on the durability of the hardened cement and causes no retrogression in strength.)

In an attempt to specify that the cement consists of essentially hydraulic silicates, the chemical requirements shown in Table 2 are specified. It should be noted that chemical requirements for both regular and high sulfate-resistant types are given. The main difference between the regular type and the high-sulfate-resistant type is that the tricalcium aluminate content is restricted to a maximum 3% for the high-sulfate-resistant type.

"A common understanding is established when the product is referred to by one of the API classes . . ."

Current and future uses . . . The API specification for oil-well cements is the result of the cooperative effort during the past several years of personnel from many companies. It is a specification planned by men who are well qualified by experience in both laboratory testing and field operations to prepare a practical, workable set of requirements for oil-well cements. The specification provides a system of specifying those properties that affect the performance of portland cement in wells.

The system is based on laboratory tests which have proved to give results applicable in the cementing of wells. Special equipment is used to simulate field conditions of temperature and pressure in many of the performance tests. In the performance tests which do not simulate field conditions, confidence in their use is justified because they have been correlated both with simulated tests and with field experience.

Because the specification embodies a realistic method of classifying portland cements for use in wells and of specifying the required properties, it serves a number of useful purposes. It furnishes the manufacturer a list of properties needed in the product, and it assures the purchaser that the product meets certain minimum requirements.

In addition, it greatly simplifies communication between the manufacturer, the distributor, and the consumer. A common understanding is established when the product is referred to by one of the API classes, because the physical and chemical requirements for each API class of portland cement are specified in terms pertinent to oil well cementing operations.

To make the specification effective, it must be used by those who manufacture, distribute, and purchase portland cements for use in oil and gas wells. Since the first edition of the specification 4 years ago, definite progress has been accomplished in applying the specification. On January 1, 1958, nine cement manufacturers had applied for and received authorization to use the API monogram in classifying and marking their portland cements.

As shown by the information in Table 3, the nine manufacturers market 37 brand names of portland cements under API classification and specification, as follows: nine in Class A, six in Class B, six in Class C, three in Class N, five in Class D, seven in Class E, and one in Class F. It is hoped that the other cement manufacturers who supply portland cements to the oil and gas industry will apply for authorization to classify, identify, and market their products in accordance with the API system.

Although nine cement manufacturers are in a position to furnish portland cements under API specification, only two or three are identifying their cements in accordance with the API specification. The reason is simple: customers are not asking for API class cements.

It is hoped that this paper stimulates the interest of personnel in the oil and gas industry to become acquainted with the API specification and to use it in identifying oil-well cements. The maximum usefulness of the API specification can be realized only when the specification is used by all who are concerned with the making, transferring, and purchasing of oil-well cements.

The API subcommitte on Std. 10A oil-well cements is charged with the responsibility of keeping Std. 10A current with new cement technology and of maintaining adequate specification values. Changes are made only after careful consideration by the subcommittee. At present, three task groups are actively considering certain changes and additions for Std. 10A. The specific objectives of the task groups are:

1. To reconsider the thickening-time values in Std. 10A and to propose such changes as may be needed.
2. To review the strength values of API Class N cement and to propose any changes that may be needed.
3. To prepare specifications for bentonite and barite as additives to cements.

Action on the recommendations of these task groups will be initiated at the mid-year standardization conference, June 1958. In the future, it is anticipated that other changes and additions will be made in Std. 10A when they are needed.

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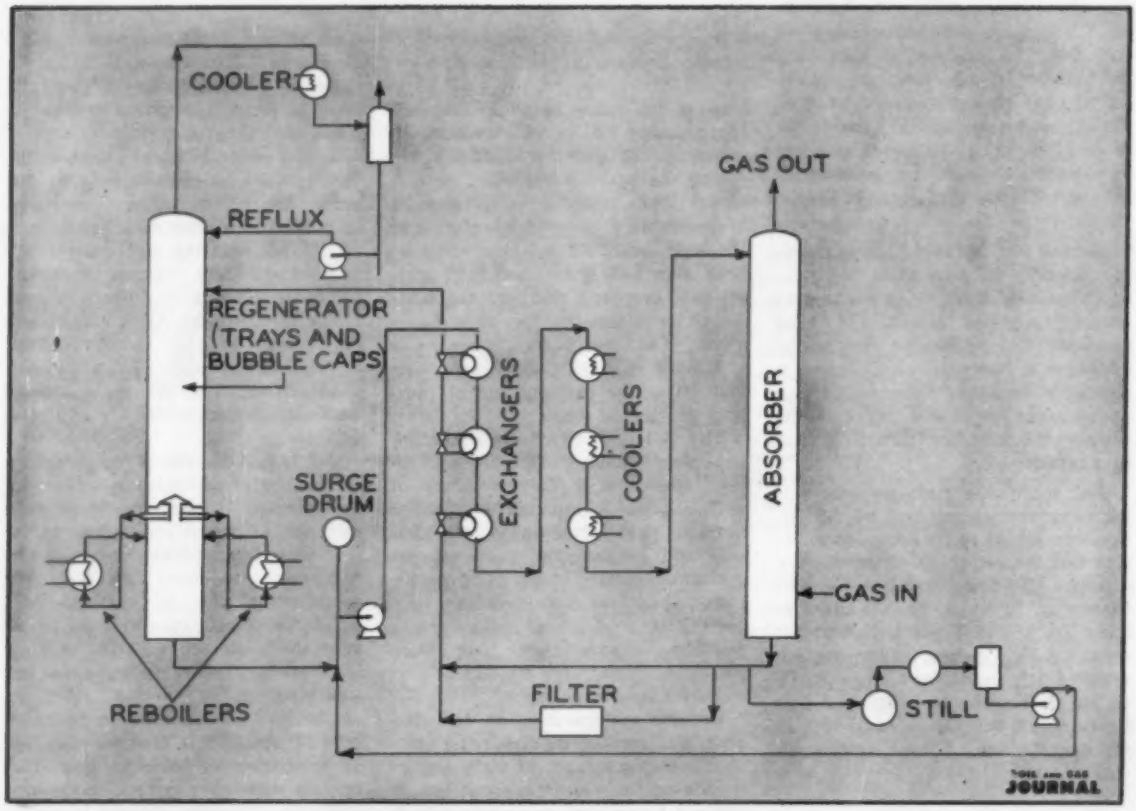
FIG. 1.



Removing CO_2 by this purification process means . . .

Longer life for MEA reboilers

– A Journal on-the-spot report tells how relatively minor changes can rejuvenate tube bundles sixfold

BY LARRY RESEN
District Editor

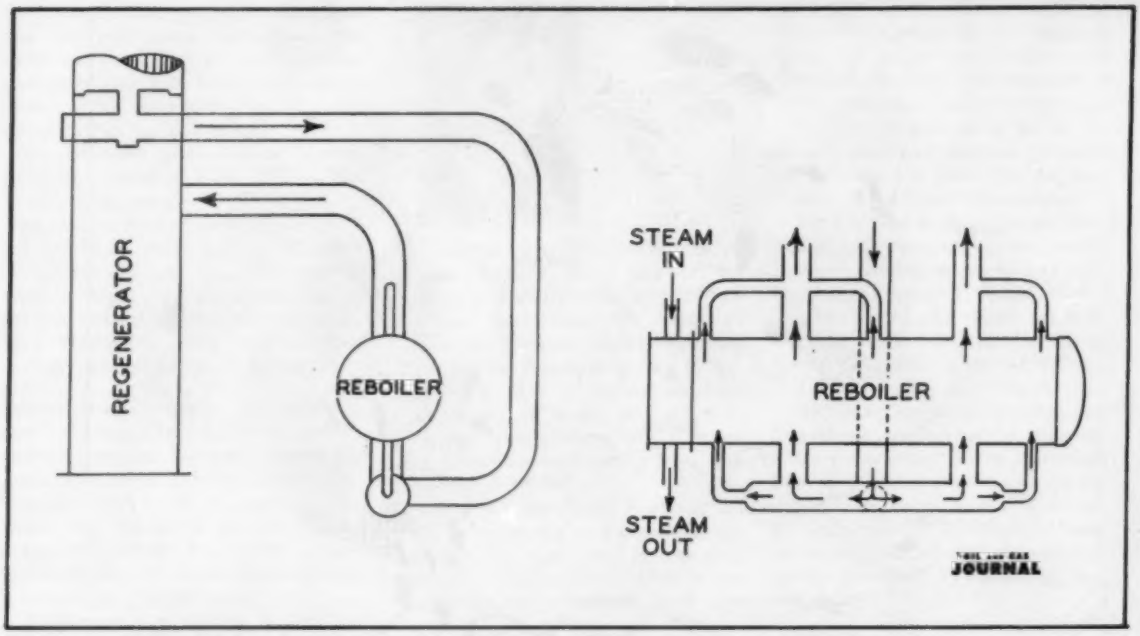
THE SERVICE LIVES of MEA reboilers at the Lake Charles, La., plant of Olin Mathieson Chemical Corp. have been extended by effective removal of stagnant CO_2 pockets.

Synthesis gas containing the hydrogen and nitrogen components along with gaseous impurities undergoes successive purification steps for removal of the undesirables before conversion into ammonia. In the first step, carbon dioxide is removed in a monoethanolamine system, and in the second step, carbon monoxide is removed in a copper liquor system.

Purification . . . In the purification process (Fig. 1), incoming gas containing approximately 15.5% CO_2, 2.5% CO, and 0.6% inerts enters an absorption column in countercurrent contact with a downcoming stream of lean monoethanolamine. This tower operates in a temperature range of 100° to 140° F. and a pressure of 15 atm. at which conditions CO_2 is picked up by the MEA solution as it passes over the cast-iron trays.

The lean incoming MEA solution contains about 1 std. cu. ft. of CO_2 per gal., while the outgoing rich stream contains about 4.5 std. cu. ft. of CO_2 per gal. The stripped gas enters subsequent gas-treating equipment for removal of carbon monoxide by absorption in a copper solution.

The rich solution from the absorber passes through a bank of heat exchangers where it picks up heat from the lean, regenerated solution and then is charged to the regenerator. Two sidestreams are maintained to condition the MEA. First, a relatively small



REBOILER MODIFICATIONS eliminated CO_2 traps. Service life has been extended from 6-9 months to 4 years. Fig. 2.

stream of dirty solution collected from numerous points in the process is pumped to a steam-distillation unit for cleanup. Second, a sidestream pulled from the rich-solution line passes through a leaf-type filter.

The second sidestream averages approximately 30 g.p.m. which means that an equivalent of the total solution charge is filtered every 12 hours. The use of the filter provides an amine solution amber in color as opposed to the dark, oily solutions found in some units without filters.

The rich amine solution is charged to the regenerator, where elevated temperatures are used to drive off the CO_2 contained within the stream. Two reboilers at the base of the regenerator tower are used alternately to maintain a temperature level within the vessel.

Steam at 275° F. is used in these reboilers and the reheated solution on the tower side runs about 230° to 240° F. A lean amine stream is withdrawn from the base of the tower and recirculated to the absorber following heat exchange with the incoming rich solution and cooling.

At first . . . Originally, the two regenerator reboilers were subject to exceptionally rich corrosion rates. Carbon - steel bundles originally supplied would have to be replaced every 60 to 90 days. An effort was made to resolve this problem by using 18-8 Cr-Ni stainless-steel tube bundles.

While some improvement was achieved the service life was still only 6 to 9 months. The critical function of the gas-purification section made this short service life especially undesirable. Fortunately, it was possible to operate the unit with only one reboiler. Costly shutdowns were avoided during retubing operations at the expense of accelerated corrosive attack.

Inspection of the reboilers indicated that corrosion was especially severe in areas where carbon dioxide was likely being trapped within the equipment. An attempt was made to prevent this by boring holes in the internal gas baffles to permit the gas to escape. However, no noticeable effect was realized.

Piping changed . . . Corrosion was finally reduced by modifying the reboiler piping (Fig. 2). The reboiler is equipped with an inlet header supplied by a 12-in. line from the well sections of the tower and two 16-in. outgoing lines into the tower base. Two 4-in. lines were tapped into the inlet header and installed so they entered the reboiler near each end.

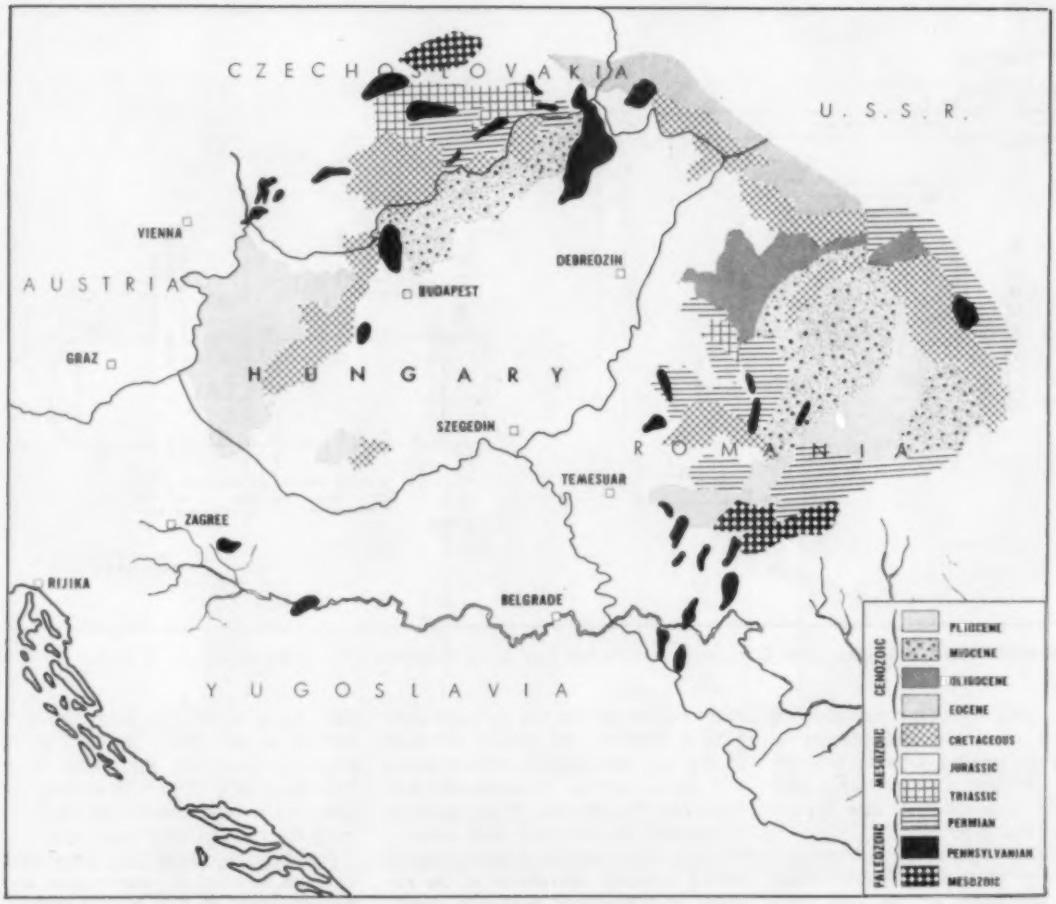
Additionally, three 3-in. lines were installed between the outlet lines and the reboiler shell. This piping arrangement permits incoming solution from the tower to be distributed through inlets at the base of the reboiler and provides five outlets at the top of the reboiler.

Distribution of the incoming stream across four inlet lines permits additional scrubbing action by the solution and dissipation of trapped CO_2. Meanwhile, the many openings at the top of the reboiler permit the CO_2 released within the reboiler to readily escape and be carried back to the tower with the heated solution where it may escape up the column.

In this manner, little CO_2 is entrapped within the reboiler and corrosion from this source has been greatly reduced. Service life of the 18-8 Cr-Ni tubes presently in service has been drastically extended, with 4 years being the experience compared with 6 to 9 months previously.

Acknowledgments

Cooperation of the management of Olin Mathieson Chemical Corp. is gratefully acknowledged as is the assistance of Gus Henrich, general superintendent of the nitrogen division, and Olin Hardy, ammonia-plant superintendent, Lake Charles.



HUNGARY has many possibilities for new oil fields. Exploration, however, is currently conducted by Masz Olai, a state-controlled enterprise. Most of its executives are not native Hungarians.

Despite sagging daily production,

Oil outlook is good in Hungary

BY GEORGE DE MOHRENSCHILDT

GEOLOGICALLY Hungary remains a good exploration province, although the present daily production is lagging. This is because of the decline of existing fields, lack of conservation methods, delays in putting wells on production, and excessive centralization of industry.

Table 1 shows all too clearly the slump in production since the peak year of 1955.

TABLE 1—OIL PRODUCTION OF HUNGARY
(Thousands of barrels)

1938	323
1943	6,285
1954	9,127
1955	12,007
1956	9,015
1957	*5,040

*Estimate according to the plan.

At the present time, Hungarian reserves hover at 150,000,000 bbl. Present plans are to increase this to 225,000,000 bbl. in the near future, but this goal seems very problematical.

Water encroachment in the Nagy Lengyel field accounts for the production decline since 1955. However, increased drilling during the past few years should give Hungary new oil fields and larger reserves.

The state-owned company drilled 2,000,000 ft. in a 5-year period, 1950-1955. Its drilling program will be doubled during the period 1956-1960, and the average well depth will be increased.

Nagy Lengyel . . . This is the largest oil field in Hungary and was discovered in 1951. During 1955 it accounted for 60% of the country's oil production. Unfortunately, a chaotic exploitation of this field resulted in rapid water encroachment. At the present time most wells are shut in to prevent the field from going completely to water. The best well can still produce 1,800 bbl. of low-gravity oil per day (15° API). This gage is open flow through 2½-in. tubing.

Nagy Lengyel produces from Tortonian pays of Miocene age, from Cretaceous chalks, and from Triassic limestones. Well depths range from 6,200

to 8,200 ft. The producing horizons are not continuous throughout the field, and the extent of the respective reservoirs has not been fully determined. The field now has 92 wells completed in various zones.

In the same general area, a new field was discovered in 1952 — Babocsa. It is mostly a gas-producing area with a present daily capacity of 5.5 M.M.c.f. There are now 5 wells on production and 12 others are in various stages of completion. Oil is present downdip on the Babocsa structure. Production comes from the Pannonian pays at 6,500-ft. average.

Southwestern Hungary . . . Recently a new field was discovered in the southwestern part of Hungary, following exploratory work that began in 1954. The discovery well, 1 Buzsac, produced 400 bbl. of oil per day. Confirmation drilling was rather disappointing, and out of nine wells drilled only two are productive.

Another wildcat success is Balatonhidveg field. High-pressure gas, tapped at 11,400 ft., resulted in a recent spectacular blowout. This well was finally cased and yielded some oil on production tests. At the present time a fishing job has delayed final completion.

Geophysical surveys were begun in 1945 in the Hahot area. Subsequent drilling resulted in the completion of three very small wells.

Detailed gravity work uncovered an unusual gravity maximum that was drilled in 1951. This resulted in a new discovery, Kiliman field. Here very shallow production is found in upper and lower Pannonian beds at about 2,000 ft. Triassic calcite was found at 2,300 ft., and the intervening section was missing. Fourteen wells have been completed in Kiliman at the present time, although none is actually on production. Of these 14 wells, 3 are gas wells with a total daily capacity of 2 M.M.c.f.

Eastern Hungary . . . Exploratory drilling has tapped three new fields since 1945 in the Alfold area: Szolnok, Mezokereszles, and Biharnagybajom. They are very small fields and little is known about them at the present time except that only marginal production has been obtained. Further drilling is still going on in the Szolnok area.

Exploratory drilling is proceeding in the Tatarules, Bukkszek, and Totkomlos areas. At Totkomlos, the state-owned company is trying to extend an old oil field. Production of the old oil fields — Maszolajfalva, Matranovak, Totkomlos, and Gellenhaza—is steadily declining.

THE AUTHOR

George de Mohrenschildt, the author, is very likely one of the world's most-traveled engineer-geologist consultants. He holds an M.S. in industrial engineering from the Institut Super. d'Anvers in Belgium, a Ph.D. in economics from University of Liege, and an M.A. in petroleum geology with a minor in petroleum engineering from University of Texas.

In 1945, he joined Pantepec Oil Co. in Venezuela as a petroleum engineer and geologist. He returned to this country again in 1946 to become assistant field engineer and geologist for the Rangely Field Engineering Committee, at Rangely, Colo. He was named chairman of the committee and field engineer in 1948 and spent 2 years in this post.

He left Rangely in 1950 to become a consultant and has operated out of offices at Dallas for the past 8 years, and is an oil producer.

For the past 4 years, de Mohrenschildt has been taking on mostly foreign consulting work and has been globe-hopping almost continuously. During this stretch, consulting jobs have taken him to Cuba, Haiti, Colombia, Mexico, France, Israel, Venezuela, and Yugoslavia.

Last year, he spent 10 months in Yugoslavia as adviser to Marshal Tito's government on new production and exploration methods through an arrangement with the U. S. Department of State. It was during this period that de Mohrenschildt gathered the material for this article.

Geology . . . Most of the Hungarian plain is covered with sands and gravels of Quaternary age and with Pliocene deposits. The Hungarian plain is divided into a western and an eastern part, termed Pannonia and Alfold; dividing line is the Danube.

Alfold is a continuous basin. Pannonia is divisible into several small basins that are separated by small mountains and fault line blocks.

Two factors control the accumulation of oil and gas in the Hungarian plain: (1) oscillation of shallow tropical seas, and (2) successive emergence of land masses during Mesozoic and Cenozoic times.

The subsurface in Hungary is characterized by fault-line trends. These were caused by the slow continuous sinking of the plains proper, and by the slow rising of the Vienna basin to the west. This movement is observed to the present day. Hungary has a considerable thickness of sedimentary deposits, especially those of Pliocene age.

Exploration history . . . The oil possibilities of Hungary were recognized prior to World War I because of the numerous seeps and asphalt deposits. The state monopoly discovered oil and gas in small quantities before 1930. Standard Oil Co. of Hungary later developed appreciable production, and in 1938 Hungarian produced about 323,000 bbl. per year.

The German-Hungarian monopoly took over production facilities during World War II and continued an active search for oil and gas. At the present time all the oil and gas resources of Hungary are state owned and operated by an enterprise called Masz Olai. This enterprise is controlled by the USSR and few of the executives are native Hungarians.

Masz Olai is a very centralized enterprise. It has proceeded with exploration on a large scale and with an intensive exploitation of existing fields. For example, the company has drilled many intermediate wells in the old Budafa field. In spite of this effort, however, production has continued to decline in this semidepleted field because of failure to institute a secondary-recovery program. Present production at Budafa has declined to about 656,000 bbl. of high-gravity oil in 1957, compared with 1,700,000 bbl. in 1955.

Lovaszi is another old field where production has declined rapidly. In 1957 the field produced 800,000 bbl. of medium-gravity crude. This compares very unfavorably with Lovaszi's 1955 production of 1,600,000 bbl.

Masz Olai is trying to establish deep production in the Lovaszi area. One well (L-363) was drilled to 13,200 ft., establishing a middle-European depth record. Drilling on the well was discontinued in 1957 because of lack of adequate equipment. Total depth of the well is believed to be in the Helvetian formation of Miocene age. The state-owned company plans to deepen L-363 when equipment is available.

Production in the old Budafa and Lovaszi fields comes from upper and lower Pannonian pays of Pliocene age. The fields have five separate sandstone reservoirs, and the average well depth is 7,500 ft. Both fields are badly depleted.

Six variables must be considered for effective gas chromatography

BY H. H. HAUSDORFF AND N. BRENNER
Perkin-Elmer Corp., Norwalk, Conn.

AN IDEAL eight-component mixture composed of normal pentane, acetone, carbon disulfide, methylene dichloride, ethyl acetate, cyclohexane, carbon tetrachloride, and benzene was selected to establish the effect of these variables on running speed, obtainable separation, and accuracy of quantitative determination (Table 1). Duplicate runs were made under each particular condition to determine reproducibility and to reject any eventual mishaps. Several conclusions were gathered from results thus obtained.

Flow Rate (and Pressure)

Flow rate and pressure are closely linked because a given column has a definite resistance to flow (impendance or pressure drop).

Linear relation . . . It was found that the relationship between flow rate and pressure for an average column follows almost a linear relationship in the range of 10 to 30 psig. and flows of the order of 50-200 ml. per minute. Therefore, the variable of most concern is the actual flow rate obtained with a given column.

Recordings were made under identical conditions by using flow rates of 50, 100, and 200 ml. per minute at a temperature of 50° C. From the retention times obtained for each peak in this manner, it became apparent that these were inversely proportional to the square of the flow rates used. In other words, by doubling the flow rate, one increases the actual recording speed by the square root of 2.

Retention times . . . To determine what happens to the respective separation between the various peaks, log retention times were plotted versus linear flow-rate units. This produced eight parallel lines for each component. (Fig. 1). Therefore flow rates compress or expand recordings without affecting relative separation. This might be compared to variations in data presentation obtained by changing the recorded speed. It also indicates that flow rates do not affect partition coefficient ratios of the various materials, and therefore, do not affect the actual separating power provided by a given column within wide flow ranges.

Keep flow rates high . . . It is often advantageous, therefore, to keep flow rates high to preserve speed of operation. The upper limit of flow rate is dictated by instrumental considerations since high pressures would be required which might be undesirable from the standpoint of leakage and over-all safety of the equipment. Similar limits are also imposed by the detector which, over flow rates of 400 ml. per minute (of helium), will become sensitive to flow noise.

This would require additional flow-regulating systems which would only contribute to the complexity and cost of the equipment. Flow rates within the recommended range are entirely sufficient to obtain recordings in reasonable amounts of time.

Reduced pressures . . . These were also investigated, but did not show any improvement in recording speeds. The sensitivity of the thermal conductivity detector is also decreased by working under reduced pressures. Therefore, it does not generally appear that connecting a vacuum pump to the exit of the column is worth special consideration.

Temperature

Temperature and pressure also are somewhat related since the material in a given column will expand due to thermal effects and increase the over-all flow resistance of the same column.

Temperature-pressure relation . . . It was found that the relationship between temperature and pressure required to maintain identical flow rates on the same column was quite linear in the range of 50° C. to 100° C. which required pressure changes from 20 psig. to 22 psig.

The same mixture was recorded at three different temperatures: 50° C., 75° C., and 100° C., and pressures were adjusted to obtain the same flow rate of 100 ml. per minute throughout. The logarithm of the retention time for each component was then plotted as a function of temperature as shown by Fig. 2. As can be seen, these lines are not straight and not parallel to each other.

Plots of the log of temperature and the log-log of temperature did not contribute to straightening these curves. Actually, these curves represent variations of partition coefficients as a function of temperature which very probably follow some complex relationship. The fact that the curves shown are not parallel also explains why certain authors claim to have obtained better resolution at higher temperature, while others say that resolution was increased at lower temperatures. However, a general trend of over-all decrease in separation is noticeable towards higher temperatures.

Keep temperatures low . . . Temperatures should, therefore, be kept as low as possible considering the speed desired for analysis. In some cases, temperatures might be used empirically to improve resolution. However, from a general point of view, the best temperature and speed compromise would be obtained by adjusting the temperature on the column to the median boiling point of the sample.

Instrument sensitivity . . . This is adjustable on the instrument by means of a 10-step potentiometer which divides the detector output connected to the recorder. Steps varying in exact factors of 2 have been provided, thus giving sensitivities of exactly 1/512 1/256, 1/128, 1/64, 1/32, 1/16, 1/8, 1/4, 1/2 and 1 of the total output. This can be used quantitatively during recordings, similar to multirange recorders.

NOTE: This is Part 3 of a 4-part series. Part 1 appeared in the June 30 issue of The Oil and Gas Journal, and Part 2 in the July 14 issue. Part 4, dealing with applications for gas chromatography, will appear in a future issue of the Journal.

Component sensitivity . . . It is obvious that for a preset sensitivity on the instrument, component sensitivity can also be increased by increasing the original sample quantity. Therefore, the same mixture was recorded under identical pressure and flow-rate conditions 5, 10, and 20 microliters to determine the effect on separation. It was found that there was very little effect on retention times or peak locations of the component, but that the symmetry of the bands was slightly affected for some components by using large sample quantities.

Band resolution . . . If one can define resolution or sharpness of bands obtainable from a given column by the ratio of retention time to half-band width, then one can conclude that the resolution of the column decreases for larger sample amounts. Above a certain sample quantity, the symmetry of bands will be lost, and preferably this limit should not be exceeded for accurate analyses.

Steep backs and tailing fronts . . . It should be noted that this asymmetry is opposite to the asymmetry generally obtained with adsorbents where the peaks exhibit tailing backs and steep fronts. In this case, bands exhibit steep backs and tailing fronts which is an indication of saturation of the column. This effect could be counterbalanced by using more column material, either by increasing the quantity of liquid partition phase on the celite support or by increasing column diameter.

In so doing, the result would be a sacrifice of speed. Theoretical considerations indicate that the upper limit of tolerable sample quantity is directly proportional to the amount of column material. Since the available sensitivity permits us to work with small sample quantities, it is desirable to keep the sample quantity small for best results.

Column Dimensions

The resolution or separating power of a column is proportional to the number of theoretical plates to which the moving components are exposed. One can, therefore, increase resolution by increasing column lengths.

An increase in column diameter will cause a loss of resolution since the uniformity and sharpness of the moving fronts of component bands decreases with increasing diameters. Larger samples and carrier gas flows would also be required to give comparable elution times and response sensitivities to those obtainable with narrow columns.

Therefore, a column diameter of ¼ in. was chosen which makes for convenient filling of these columns with material. Resolution is then varied only by altering the column length. Effective column length can be set from 1 to 4 m. of U-shaped or up to 20 m. of spirally coiled columns. Resolution or separation is roughly proportional to the square root of column length, but running speeds decrease considerably faster.

Column Material

The column material consists essentially of two components: one being the inactive solid supporting material, and the other being the partition liquid or fixed phase.

Two criteria should determine the choice of the solid.

1. It must have the largest possible surface area to provide maximum number of plates.

2. It must be completely inactive with respect to components passing through the column to avoid tailing of bands.

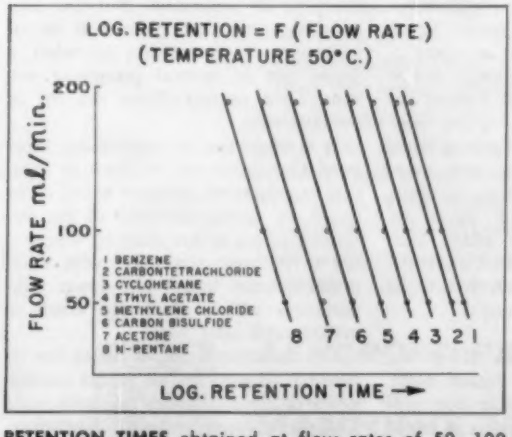
3. It must permit reasonable flow of carrier gas without excessive pressure drop.

Adsorbents did not meet this requirement and were, therefore, not found to be suitable. Acid-washed Celite and related materials such as C-22 firebrick, so far, have proved to give the best results.

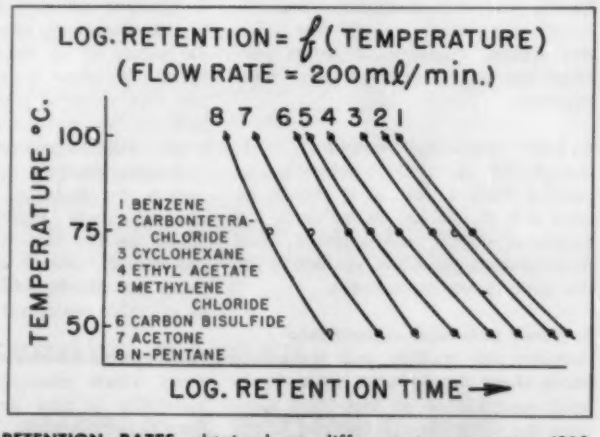
Particle size . . . This in itself does not matter too much beyond a certain limit of approximately 150 μ or 100 mesh, below which no gain in resolution is obtained and only high column resistance and subsequent slow flow rates result. However, uniformity of particle size is significant to provide sharp and undisturbed moving fronts in the column. Therefore, the material is sieved and only the portion between two sieves is used to provide a narrow cut in particle size.

The partition liquid . . . The stationary phase is subject to an entire field of study in itself since its chemical composition will greatly affect partition coefficients and will therefore provide poorer or better results, depending entirely on the mixture to be analyzed.

The choice of the fixed phase is probably the most important factor for analytical work in gas-liquid partition chromatography. In this respect the field is only beginning to understand the extreme significance of being able to vary the selectivity for components with different column materials of specific chemical character. Large numbers of liquids have been investigated so far to arrive at the maximum separating efficiencies obtainable by this technique in various fields of routine applications. Con-



RETENTION TIMES obtained at flow rates of 50, 100, and 200 ml. per minute show that change in flow rates expand or contract recordings without affecting relative separation. Fig. 1.



RETENTION RATES obtained at different temperatures (50°, 75°, and 100° C.) show that partition coefficients are a function (probably complex) of temperature. These lines, unlike Fig. 1, are neither straight or parallel. Fig. 2.

TABLE 1—QUANTITATIVE ANALYSIS

Recording No.—	1-2		3-4		5-6		7-8		9-10		*11-12		
Column pressure	20		30		15		21		22		20		
Flow rate, ml. He/min.	200		380		100		200		200		200		
Temperature, °C.	49		49		50		75		100		50		
Concentrations found—													Avg.
Pentane	4.50	4.15	4.98	4.71	5.11	4.72	4.77	4.77	4.30	4.25	4.51	4.56	4.44
Acetone	7.82	7.65	8.25	7.87	7.87	8.27	7.71	7.69	8.28	8.26	8.18	8.11	7.99
Carbon disulfide	8.76	8.98	9.05	8.58	8.86	8.85	8.20	8.20	8.72	8.81	8.15	8.17	8.60
Methylene dichloride	8.94	8.44	8.38	8.45	8.18	8.40	8.40	8.40	8.72	8.75	8.10	8.11	8.44
Ethyl acetate	16.28	16.80	16.00	16.60	16.05	15.90	16.41	16.32	17.19	17.02	16.70	16.57	16.49
Cyclohexane	16.50	16.49	16.50	16.35	16.42	16.55	16.73	16.56	15.69	15.69	16.59	16.62	16.39
Carbon tetrachloride	16.92	17.80	16.60	17.10	17.20	16.80	17.30	17.05	16.70	16.74	16.80	17.29	16.98
Benzene	20.20	20.19	20.40	20.30	20.30	20.70	20.41	20.92	20.30	20.40	20.90	20.50	20.46

*Twice the sample quantity.

siderable improvements can, however, be anticipated in the future as workers will seek for highly selective fixed phases to suit their individual problems.

In the meantime, however, several criteria should generally be considered:

1. High boiling point . . . It was found that generally the boiling point of the fixed phase should be at least 150°-200° C. above the highest temperature which is intended to be applied to the column in the instrument. Thus, if temperatures up to 150° C. will be used, the stationary phase should be of liquids with a boiling point higher than 300°-350° C.

2. Low vapor pressure . . . This is somewhat parallel to the boiling-point requirement. A vapor pressure of less than 1 μ at operating temperature is generally considered the maximum permissible level consistent with long column life.

3. Low viscosity . . . The widths of bands or moving components is inversely proportional to the speed of diffusion of components into the stationary phase and out. This is proportional to the viscosity of column liquids and best resolutions are obtained if viscosity is kept low. For this reason, greases and solids perform less satisfactorily at lower temperatures.

4. Low molecular weight . . . Although this criterion is somewhat in conflict with 1 and 2, it should be used if a choice has to be made for liquids of similar boiling points, since molecular weight affects resolution for the same reason as viscosity.

5. Some structural resemblance . . . Between the mobile and stationary phase there should exist some structural resemblance so that ideal solutions are more closely realized in the column. This will help to provide better band shapes because of more linear isotherms and consequently better over-all resolution. Thus, for example, aromatics should preferably be analyzed with a column liquid having some aromatic character, and so on.

6. Polarity (internal pressure) . . . Nonpolar liquids with low internal pressure create weak fields around the dissolved molecules and, therefore, exert weak attractive forces. Components are most likely to be eluted from the column in their order of vapor pressures or boiling points. Liquids with increasing polarity or internal pressure will create stronger attractive fields around the dissolved molecules and exert strong attractive forces.

Therefore, considerable deviations in the order of elution will be noticeable. Partition coefficients will be considerably more affected by differences in molecular structure, or electron arrangements in the molecules of the mobile phase.

Thus, if two close boilers cannot be readily separated, highly polar stationary phases should be used. On the other hand, if coincidental overlap is encountered with two components having a considerable difference in boiling point, then nonpolar liquids should again provide necessary separation.

7. Electron interaction . . . Preferably the stationary phase should be of the nature of an electron acceptor if the mobile phase is an electron donor and vice versa to provide highest selectivity for components to be analyzed. Advantages can be gained from hydrogen bonding effects and association, for instance. Thus, alcohols are efficiently separated using an amine as the stationary phase and, reciprocally, amines are best analyzed using column liquids with hydroxyls as effective structural groups.

8. Chemical interaction . . . High activity which inherently means some instability is also desirable for column liquids in some cases, as it might help in separating two closely following components for ordinary columns. Advantages can be gained from complex formation and other types of weak chemical bonding effects between mobile and stationary phase.

Some authors have recommended the addition of silver nitrate to the stationary phase in saturate-olefin separations. The salt will complex with double bonds. Results have been extremely successful so that other types of complex formations should be worth while to investigate.

9. Solubility . . . The stationary phase should preferably have some solubility for components in the mobile phase. However, at very high solubilities deviations from linear isotherms might sometimes be encountered where the attractive forces of solution are too strong.

This will again result in poor symmetry of recorded bands, which, however, might tail in one direction or another depending on whether the isotherm curves to or from the pressure axis. At very low solubilities overloading effects will become noticeable even for small sample quantities.

The theory of solutions is still far from accurate and it is still impossible to predict the separation given by a solvent from the properties of this solvent and that of the components to be separated. But the nine considerations just given will be of assistance if one wishes to select a liquid out of several promising solvents, and narrow down the list of possible ones.

It is important to emphasize, however, that more can be done to separate components, without sacrifice of speed, by proper selection of the stationary phase rather than by attempting to increase resolution with additional column length and lower temperatures which ultimately result in considerable time losses.

On the other hand, it might not be possible to separate all of the constituents in more complex mixtures using a single column material. Therefore, several columns might have to be used on the same problem in more difficult cases.

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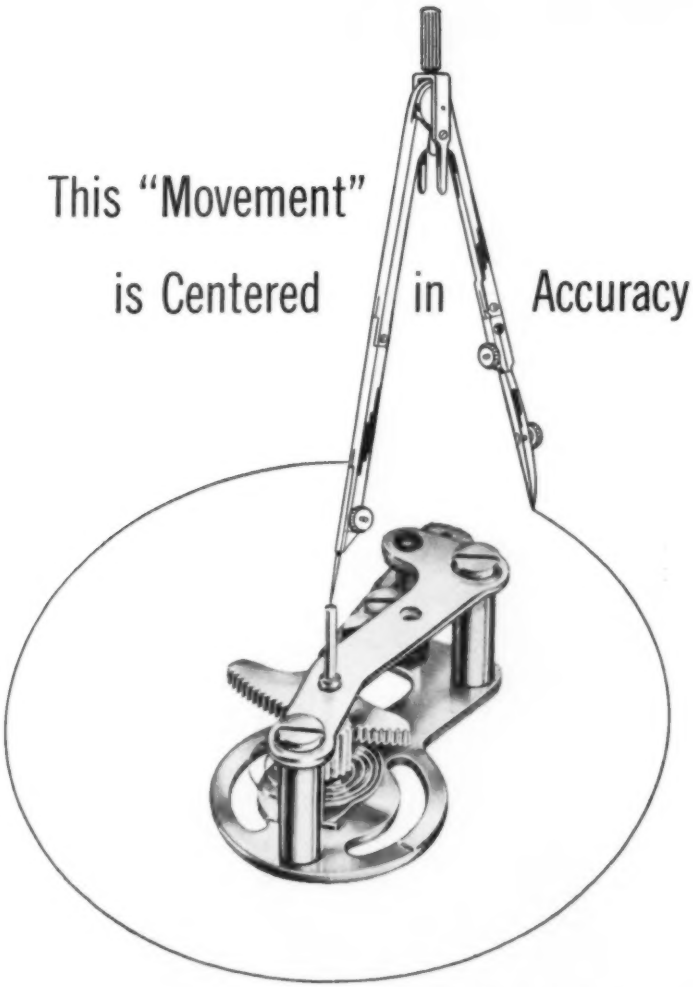

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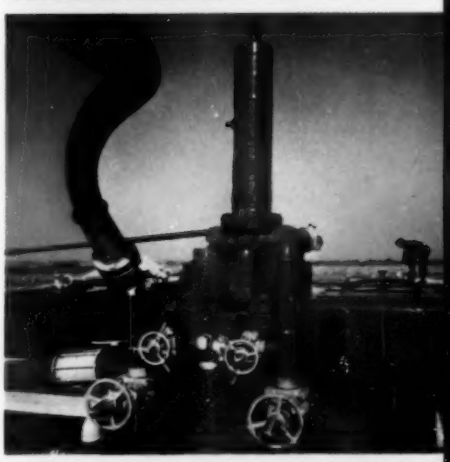

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Fig. 1

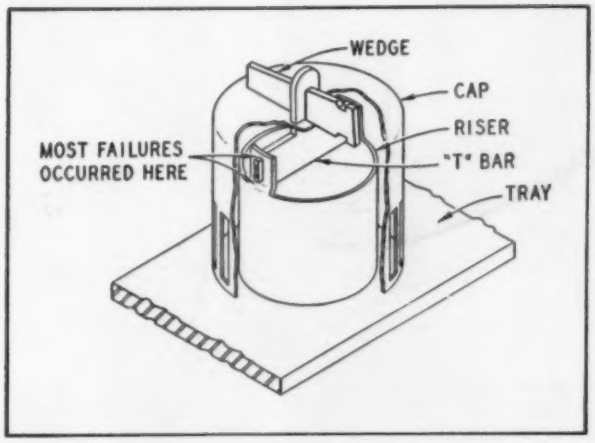
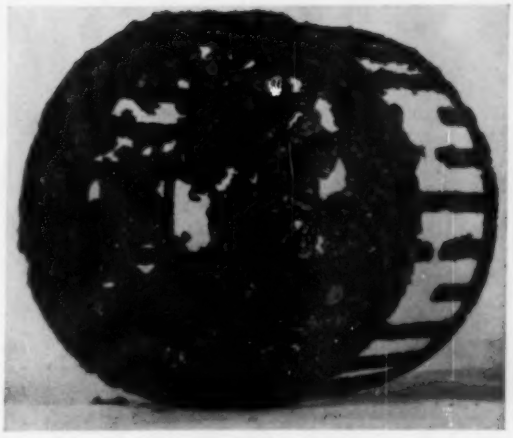


Fig. 2



This amine still's bubble cap . . . will corrode, unless proper . . .

Methods of fighting corrosion

are adopted by refiners

BY J. S. CONNORS AND C. L. SEYER
Phillips Petroleum Co.

CORROSION PROBLEMS commonly found in plants processing light hydrocarbons include corrosion of amine treaters, steam systems, cooling-tower piping, butane-isomerization units, sour-gasoline transfer lines, and finished-product storage tanks.

Corrosion in amine-treating units should always be given serious consideration. The rate of corrosion can be minimized by process-design changes to prevent high-temperature and oxygen degradation of amine, by the use of reclaimers, and by stress relieving of key equipment.

Carbon dioxide is the chief cause of corrosion in steam systems. After the maximum practical measures for its removal have been employed, the use of inhibitors will prove profitable.

Cooling-tower piping is subject to severe external corrosion because of alternate wetting and drying under oxidizing conditions. Periodic replacement of water-distribution piping, with possible use of unreinforced plastic pipe, is a solution for this portion of the problem. Cooling-coil-piping corrosion is handled by providing corrosion allowance and by use of an inorganic zinc-dust coating.

Paper presented at annual meeting, API Division of Refining, Los Angeles, 1958, under the original title: "Solutions to Corrosion Problems in Light-Hydrocarbon Liquids Plant."

Aqueous-Amine Treaters

In 1947 it was necessary to construct a treater to remove hydrogen sulfide (H_2S) from a large volume of gas in order to complete a sale to a gas-transmission company. In view of our previous experience and that of others the problem of potential corrosion was a matter of considerable concern.

Diagnosis . . . In the design of amine treaters, it should always be assumed that the circulating solution will be corrosive to some extent. Amines oxidize readily and the oxidation products are extremely corrosive. Amines are not stable at elevated temperatures, tending to decompose, and the products of decomposition are very corrosive.

These two characteristics of the amines used for gas treating made it imperative that every precaution be taken in both the plant design and operation to: (1) protect the solution from any contact with air; (2) prevent excessive temperatures; (3) provide a means for the removal of corrosive compounds as they are formed; and, (4) design the plant mechanically to withstand a somewhat corrosive solution at all times.

Remedy . . . The plant was designed on this basis; and, except for the bubble caps, was constructed entirely of carbon steel. The absorbers and stills were stress-relieved. However, because of an oversight in construction, the shells of the still kettles were not stress-relieved as designated in the specifications.

Side-stream filtration of the circulating solution was provided. Means for keeping the solution under a gas blanket were provided. Kettle temperatures were held to a maximum of 245° F. and heating element skin temperatures were held to a maximum of 285° F. In addition, means were provided to permit reclaiming the solution whenever tests indicated the presence of corrosive compounds.

Results . . . In the period from 1948 to 1953, it was found necessary to

stress-relieve the heat-exchanger heads and return bends to prevent stress-corrosion cracking. It was also necessary to replace a section of the foul-solution line between the heat exchangers and the still with prefabricated stress-relieved pipe.

In addition, in 1953, after attempting several repairs to small stress-corrosion cracks in the shells of the still kettles and stress-relieving of the repairs locally, it was deemed advisable to have the shells removed from service, stress-relieved, and reinstalled. Since stress-relieving these portions of the plant, no additional cracking has occurred in this equipment.

Since 1953, because of stress-corrosion cracking of the chimney ears in the removable bubble-cap assemblies, as shown in Fig. 1, it has been necessary to repair and stress-relieve practically all chimneys in the absorbers and stills. Severe pitting of the 16-gage, Type 410 stainless-steel bubble caps has made it necessary to replace approximately 50% of all bubble caps.

This type of attack is shown in Fig. 2. Experiments are under way to determine whether a heavy cast-iron cap or a thin (16-gage) Type 304 stainless-steel cap will be more economically serviceable than the Type 410 caps.

The only other corrosion encountered has been in the still overhead condensers. Because of general thinning of the tubes, it has been necessary to retube two of the six overhead condensers.

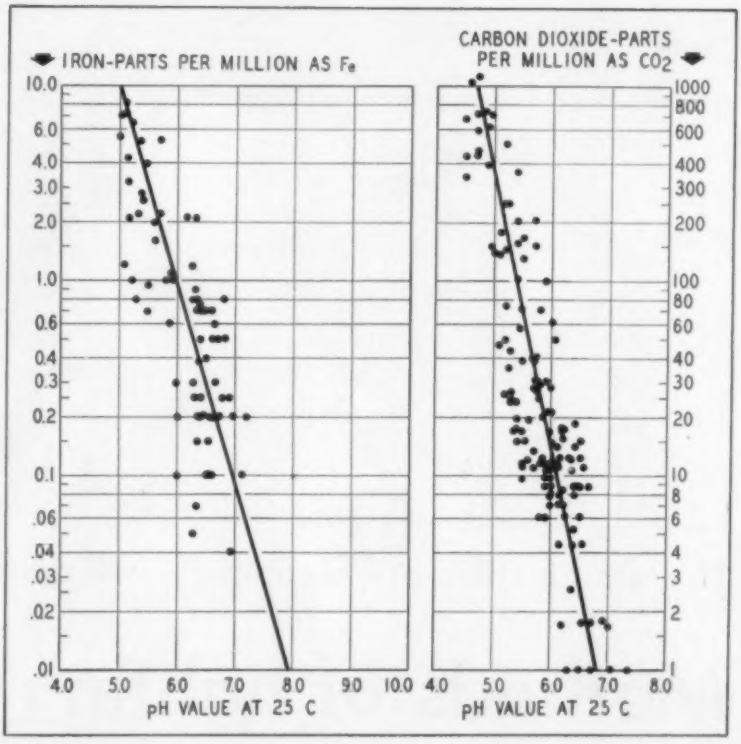
It has been necessary to place the portable reclaimer in operation twice, for periods of approximately 12 weeks each, when tests showed the presence of nitrogen compounds other than monoethanolamine in the solution.

The precaution taken in the design and operation of this treater have been successful in preventing corrosion, inasmuch as all vessels, pumps, heat exchangers, lines, and valves originally installed are in service and apparently undamaged.

Steam Systems

Several years ago, it was considered that corrosion in a steam and steam-condensate system was excessive. At that time production of 250-psig. steam averaged over 900,000 lb. per hour. In producing this steam it was necessary to supply approximately 10,000 gal. per hour of makeup water to the system. This makeup water was softened in a two-stage, deaerating, hot-process, lime-soda-phosphate softener.

Tests showed that the oxygen (O_2) content of the softened makeup water and the produced steam was zero.



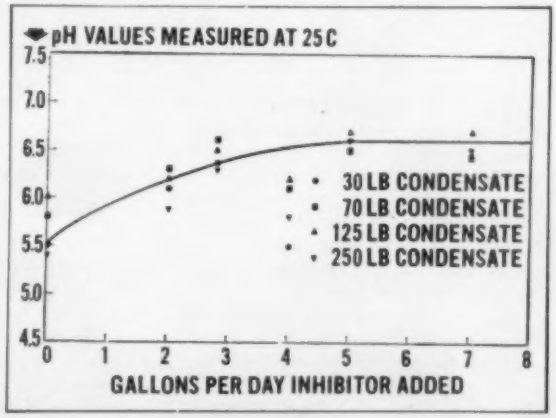
TEST DATA show direct relationship between CO_2 content of steam condensate, its iron content and pH. Fig. 3.

Diagnosis . . . It was thought that the corrosion was caused by the carbon dioxide (CO_2) content of the produced steam. This CO_2 was formed within the boilers by the decomposition, at boiler temperature, of approximately 80% of the residual sodium carbonate (Na_2CO_3) contained in the softened makeup water.

The Na_2CO_3 decomposes into CO_2 and sodium hydroxide (NaOH) according to the following equation:

$$Na_2CO_3 + H_2O + Heat = 2\,NaOH + CO_2$$

Considerable testing provided data which established a direct relationship between the CO_2 content of steam condensate, its iron content (corrosion product), and the pH. This data is shown in Fig. 3. The average CO_2 content of the high-pressure (250 lb.) steam was approximately 10 p.p.m. and, as was expected, the CO_2 content of the exhaust steam was considerably higher and varied widely.



EFFECT on the pH of the steam condensate with varying quantities of the amine blend added is shown in this diagram. Fig. 4.

Remedy . . . After reviewing the work of the Bureau of Mines on the use of neutralizing amines in steam boilers, it was decided to attempt to reduce the rate of corrosion by adding a small quantity of a blend of neutralizing, volatile amines to the boiler feed water. Volatility characteristics determined the selection of a blend

containing cyclohexylamine, benzyl,-amine, morpholine, and dimethylethanolamine.

The effect on the pH of the steam condensate with varying quantities of the amine blend added is shown in Fig. 4. This data indicated that the optimum effective protection would be afforded by the addition of 4 to 5 gal. of the blend per day or approximately 1.5 lb. per million pounds of steam produced.

Results

The addition of the amine blend to the steam system in these proportions resulted in a 50% reduction in the man-hours spent in repairing kettle elements and a 60% reduction in man-hours spent in repairing and replacing small nipples and valves. Test coupons installed after use of the inhibitor was started show corrosion rates of 0.001 in. to 0.005 in. per year.

The results obtained by the addition of this type of inhibitor to a steam system have been so successful that its use has been expanded, and it is now being used in approximately 50% of our gasoline plants where a relatively high percentage of steam condensate in the boiler feed water makes its use economical.

Cooling-Tower Pipe Corrosion

The water-distribution piping in cooling towers, particularly in towers of the atmospheric type, is subject to severe external corrosion. This corrosion is often ignored because leaks in this piping can be tolerated, and even structural failure of the pipe is not usually a catastrophe.

Even so, such failures can result in damage to the tower-fill material as well as reducing the efficiency of the tower. Figs. 5 and 6 show an example of water-distribution piping in which structural failure is rapidly being approached.

CORRODED water-distribution piping indicated structural failure is rapidly being approached. Fig. 5.

CLOSEUP VIEW shows a portion of the corroded water-distribution piping. Fig. 6.

SEVERE CORROSION can be noted on this typical cooling-coil piping. Fig. 7.

Piping to hydrocarbon-cooling coils in a tower is subject to external corrosion which is most severe at the point of entry into the tower. Pitting corrosion rates on this pipe are as high as 0.125 in. per year. A buildup of mineral deposits resulting from the water evaporating on the hot piping often hides the corrosion which is occurring.

Ordinary paint used for general plant painting is of little value in preventing this corrosion. Failure of this hydrocarbon piping would likely result in a fire with loss of the tower and other equipment. A hazard such as this, with a high corrosion rate, cannot be tolerated. Typical coil piping which has been severely corroded is shown in Fig. 7.

Diagnosis . . . Cooling-tower water is essentially noncorrosive when properly treated. The absence of corrosion of tower hardware, which was constantly wet, supported the assumption that the water was noncorrosive. Therefore, it was concluded that the corrosion of both the water-distribution piping and the piping to the hydrocarbon cooling coils was the result of alternate wetting and drying under oxidizing conditions. In effect, this is simply atmospheric corrosion accelerated by warm, moist conditions.

Remedy . . . For the water-distribution piping, copper-alloy materials were considered but quickly eliminated when compared with periodic replacement of steel pipe. Plastic pipe was then considered, with rigid polyethylene being selected as the most economical.

The cost of rigid-polyethylene pipe is comparable to the cost of steel pipe except for the molded-polyethylene fittings. To avoid the use of these expensive fittings, welded construction is to be used except for the couplings used for connecting the spray nozzles.

The solution to the corrosion of the hydrocarbon coil piping was to apply an inorganic zinc-dust coating, and also to provide a ⅛-in. corrosion allowance in all replacement pipe. The zinc-dust coating was selected after testing some 20 coatings in several towers during the past 10 years.

Results . . . The first installation of rigid-polyethylene pipe is being made at present. Accelerated laboratory exposure tests are inconclusive to date, and this test installation will determine actual service life as compared with a life of 5 to 8 years for ¼-in. wall steel pipe.

The zinc-dust coating on the coil piping is providing protection for 2 to 3 years. The principal advantage of the zinc-dust coating is that only one coat is required, which usually permits application to existing piping without its removal from service.

Minor difficulties of application have been overcome with experience. The ⅛-in. corrosion allowance provides a safety factor which allows considerable latitude in scheduling recoating.

Testing of several new coating systems is continuing, including hot-sprayed applications and coal-tar-epoxy materials. These new systems appear particularly promising for a less severe service, such as hydrocarbon headers which are not subject to continual spray and which operate at a maximum of 180° F.

BOOKS

CONTROL OF NONMANUFACTURING COSTS. Published by the American Management Association, Inc., 1515 Broadway, New York 36, 142 pp. $3 (AMA members: $2).

Many companies today have discovered that higher sales volume does not necessarily mean greater net profit. Increased costs can reduce profit margin—and hidden costs are particularly dangerous.

This AMA special report shows how selected companies apply imaginative solutions to the problems of higher costs in fiscal, marketing, personnel, and office management areas—how they find new profit opportunities in administrative cost control. Representatives of Lever Brothers Co., Gulf Oil Corp., Radio Corp. of America, etc., discuss such topics as expense control in a changing business environment, the cost of cash handling and mishandling, and the budgeting process.

The report includes three company studies in reducing and controlling office costs (Johns-Manville Corp., United Air Lines, Joseph T. Ryerson & Son, Inc.).

ELECTROSTATICS IN THE PETROLEUM INDUSTRY. Edited by A. Klinkenberg and J. L. van der Minne. Published by D. Van Nostrand Co., Inc., 257 Fourth Avenue, New York 10, New York. 191 pp. $8.

This book is the result of research and development work over a several-year period by the Shell group of companies. This intensive research has culminated in the discovery and development of a potent antistatic additive. Too, a better understanding has been gained of the way in which static electricity is generated and how its accumulation can be prevented.

The book covers completely the reasons for the study, how the work was done, and the results obtained, including the theoretical background of the subject.

Part 1 of the book is divided into four chapters: (1) General aspects; (2) Research and development;; (3) Explosion and fires; and (4) Safeguarding of operations.

Part 2, on theory and experiments, has these chapter headings: (1) Basic concepts; (2) Generation of electricity; (3) Electric conductivity; (4) The electric field; (5) Ignition by electric discharge; (6) Measuring methods; (7) Large scale tests in tanks; and (8) Experiments with fueling equipment.

The appendix is divided into five parts: (1) Determination of charging tendency; (2) Determination of conductivity; (3) Electrostatic field strength recorder; (4) Volumetric flow rate for linear velocity 1 m/sec.; and (5) General surveys of static electricity.

TRACE ANALYSIS. Edited by John H. Yoe and Henry J. Koch, Jr. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16. 672 pp. $12.

The book, consisting of papers presented at a symposium on trace analysis held at the New York Academy of Medicine in New York in 1955, contains 24 chapters divided into three parts.

Twenty of the papers deal with methodology, while two concerned instrumentation, and two discussed sensitivity, separation, concentration and contamination.

One of the editors, Koch, explains in his introduction, "Though the term 'trace element' cannot be defined precisely, it may be considered to be a constituent of a biological, chemical or structural system present in minute quantities in the system, but having an important effect on the attributes of the whole system."

The volume covers such fields as chromatography and electrochromatography, ion exchange, extraction, chemical microscopy, spot tests, colorimetry, fluorometry, flame spectrometry, potentiometry, coulometry, polarography and voltammetry, amperometry, emission spectrochemical analysis, gamma-ray spectroscopy, mass spectroscopy, X-ray spectroscopy, X-ray micrography, neutron-activation analysis, and microbiological techniques.

Other parts deal with instrumentation, the interaction of beta particles with matter, trace element sensitivity, separation, concentration, and contamination.

PETROLEUM SOURCEBOOK. 1958. Published by National Petroleum Bibliography, Box 3586, Amarillo, Tex. 179 pp., $6.

This compact volume contains more than 4,000 references to books, maps, articles, and technical papers of 82 countries and 82 states, provinces, and geographical regions. The material covers all fields of petroleum technology including exploration, production, transportation, refining, and marketing, and was gathered from publications of state agencies, federal agencies, universities, technological societies, and oil publications. This is the first of an annual series designed to give a yearly record of worldwide oil operations as reflected in the literature of the time.

THE FUTURE SUPPLY OF OIL AND GAS. By Bruce C. Netschert. Published by Johns Hopkins Press, Homewood, Baltimore 18, 134 pp., $3.

In this report, technology is considered a dynamic factor of great importance in its impact on future oil and gas availability. Utilizing the real variables—economic, technological, and geological—the author sets up a new framework of concepts and definitions. The sections deal with an estimation of the natural stock in the United States, a listing and description of existing estimates of future capacity and production in the period through 1975, the indicated future course of technology and its relation to future productive capacity, an estimate of domestic availability in 1975 based on the findings with respect to technology and natural stock, and a brief discussion of the possible role of alternative sources of supply, imports, and synthetic equivalents.

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

Tanks, lines, pumps, sump pits:

Plastic repair may solve leak problems

A 36-FT.-DIAMETER tank bottom at the Sunray Mid-Continent tank farm and natural-gasoline plant located at Jennings, La., was found to be completely pitted with pin holes, causing extensive seepage around the exterior walls of the tank. The bottom of the tank was badly corroded and at first engineers thought that it would be necessary to replace the entire bottom of the tank.

This was a bolted bottom and not a welded-bottom tank. Preliminary estimates indicated that it would mean an expenditure of about $6,000 to replace the tank bottom with new steel.

Case histories provided by Polybond Corp., 944 Poydras Street, New Orleans, La.

Plastic repair entailed approximately one-half the cost. Crude oil was removed, and the tank chemically cleaned. Thermal-setting plastics, reinforced with glass cloth, were applied. This made a permanent bond on the entire floor of this tank and completely stopped all leaks. No outside heat was required to thermally set the material, heat being provided through the use of catalysts, mixed with plastic resins.

This tank has been back in service for over a year now, with no further loss of products. Application of plastic materials was completed in 1 week from starting date of cleaning and decontaminating the tank. This compared with an estimate for a minimum of 1 month to replace the bottom with steel.

This tank was back in operation in 25% the normal repair time at a repair cost of 50% of that of a steel bottom. The inert-plastic bottom should outlast for many years the side walls of the tank. Because of superior resistance to solvents contained in petroleum crude oil, this tank bottom is expected to last indefinitely.

PLASTICS TECHNICIANS apply a special thixotropic plastic, brushing it on the exterior seams and riveted areas to be treated.

Tank-roof repairs . . . A graphic example of what can be achieved with the plastics repair process is illustrated in the job done on the roof of tank No. 746 at the Esso Standard Oil Co. refinery at Baton Rouge. This gasoline tank had a 36-ft.-long rip at the point where the cone roof joined the shell of the tank as a result of extreme internal pressure.

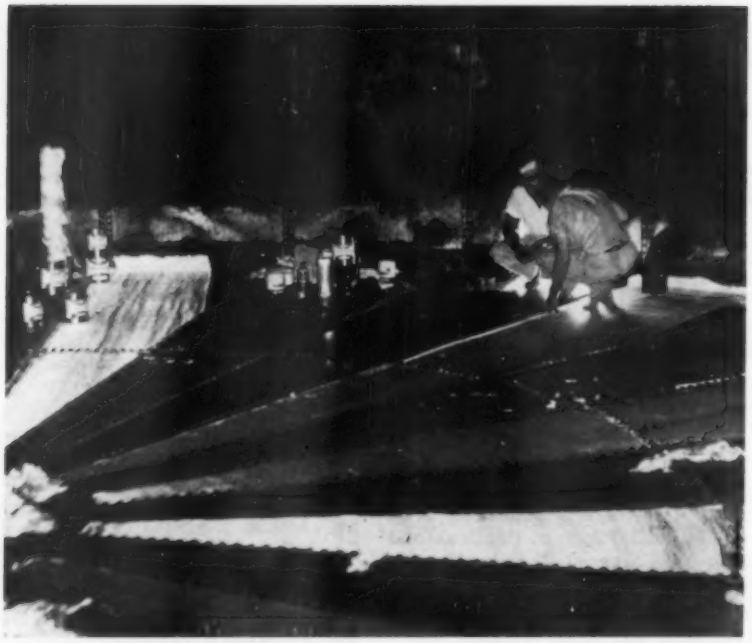
Esso's engineers estimated that it would be necessary to take this tank out of use for a period of more than 1 month to make the necessary repairs. Their estimate of cost was a minimum of $3,000 for materials and labor. It was estimated that application of glass cloth laminated with plastics could be done in just 2 days without removing any products from the tank.

The job was done 30 months ago at a cost considerably less than the estimate of repairing by welding with steel. Because of the success of this venture in saving both time and money, Esso has adopted this as a standard procedure for tank repair.

Exterior-wall patching . . . Ten months ago, Gulf Oil Corp. had tanks at various points in Alabama, Mississippi, and Louisiana which had a total of 22 severe leaks, many of which were flowing in a steady stream causing serious loss of product, as well as serving as a fire hazard.

It was necessary to apply patches to the exterior walls of these tanks while they were in service and under normal flow pressures from within the tank. All of the leaks were sealed early in 1957, and none have been reported as giving way as of this date. Gulf engineers completed a check of all patches on December 6, 1957, and reported that all were holding well.

Because of the success achieved in this first test period, Gulf is contemplating an extensive tank-lining and seam-sealing program as part of its long-range preventive-maintenance undertaking.



THERMAL-SETTING PLASTICS, reinforced with glass cloth, are applied to make permanent bond on the entire floor of this tank and completely stopped all leaks. No outside heat was required to thermally set the material, heat being provided through the use of catalysts, mixed with plastic resins.

Naphtha-line repairs . . . At the extreme top of No. 8 pipe still at the Esso refinery, naphtha vapors were leaking out at a temperature of 235°. Engineers estimated that it would be necessary to close down the entire operation on this pipe still to make repairs. The minimum loss to the company was estimated at $12,000, while the maximum could have run to $30,000 or more. Plastics designed to withstand high pressures and high temperatures were used to repair this leak without 1 hour's loss in still operation. The cost of the repair was only a fraction of that which the company would have suffered had the still been closed down.

In another pipe still at the Esso refinery, naphtha was leaking at a pipe thread under 110 psi. pressure at normal temperature. Esso engineers estimated that it would also be necessary to close down the still for mechanical repairs unless the plastic process could be used. Again this leak was handled under pressure without necessitating any lost time on the unit.

Sealing exterior seams . . . Two years ago, Cities Service refinery at Lake Charles began to study this method of sealing leaks and seams and rivet points on storage tanks. At various times, several tanks were taken out of operation, their exterior seams and riveted areas were sand-blasted to provide a clean surface for the application of a special thixotropic plastic, which could be brushed on.

Repairs to these leaking areas have been so successful that the process has become standard procedure at Cities Service.

THE FAST-HARDENING TIME of the special thixotropic plastic allows a worker to begin painting the tank in one area while plastic technicians continue to apply the plastic on other areas of the big oil-storage tank.

Centrifugal-pump repairs . . . Two years ago, a 12-in. centrifugal pump used to move river water, sand, and silt from the area of the Esso refinery in Baton Rouge, was declared junk because of interior erosion. The pump, which cost approximately $2,000, could be salvaged, plastic engineers believed. They recommended that interior walls of the pump be rebuilt with plastic putty in deeply pitted areas, and the interior with glass cloth laminated with plastic resins. This was done and the pump put back into service.

After having been operated for 2 years in this repaired condition, the pump was broken down and examined, and no visible wear was noted. As a result of this saving, Esso has adopted this as standard procedure and more than two dozen pumps have been repaired at a cost of approximately 10% that of a new pump.

Sump-pit repairs . . . One of the most difficult plastic repair jobs undertaken was the repair of a sump pit at the Ethyl Corp. plant at Baton Rouge. On this particular job, concrete walls were leaking a combination of TEL and water waste being evacuated from other units through the sump. An entire area surrounding the sump was contaminated, and conventional methods of solving this problem were estimated to cost more than $100,000. It was decided to attempt plastic repair.

When the TEL and water were removed from the pit, there was a considerable back flow of leakage from the contaminated area. Because of the severe corrosion caused by the TEL, the walls of the concrete pit were deeply etched and little bonding surface was available. The walls were crumbling, almost to the state of poor mortar mixture.

It was necessary to seal off all individual leaks into the sump with thermal-setting putties before undertaking repairs to the walls. The entire job was completed in 5 days under severe conditions, working in special suits needed for protection against TEL.

Here are five sets of instructions for proper

Compressor operation

WHEN UNLOADING compressors equipped with hand-operated bypass (with the compressor operating under power of its driver), the following steps are used:

1. Close suction block valve in first stage until almost completely closed.
2. Crack bypass valves open in first stage.
3. Complete closing of suction block valve and simultaneously complete opening of bypass valve.
4. Close discharge block valves in first stage.
5. Similarly unload in sequence each next higher stage in same manner as indicated in steps 1, 2, 3, and 4.

Operation with suction and bypass block valves closed and discharge block valves open should be minimized to avoid pulling a vacuum on the suction side of cylinder with the attendant hazard of air leakage into cylinder.

When a compressor is equipped with clearance pocket or suction valve unloader, with compressor operating under power of its driver, and it is desired to unload it, the following steps are required (the same steps apply for unloading unit for starting):

1. Remove load by opening cylinder unloaders either through automatic controller where provided or, if manually, in capacity steps successively from low-pressure stage to high-pressure stage.
2. Close suction block valve on low-pressure stage.
3. Close discharge block valve on low-pressure stage.
4. Similarly close suction and discharge block valves in this order for each next higher stage.

Check Each Shift

For gas-engine-driven compressors, the operator should observe and/or record the following points during his shift:

1. Crankcase oil level. Keep record of quantity of oil added and hours operated between oil changes.
2. Governor or dash-pot oil level.
3. Force-feed cylinder and packing lubricators should be checked frequently for oil-level record of quantity of oil added.
4. "One shot" valve-stem lubricator. One full stroke every 4 hours of operation.
5. Engine-circulating oil pressure.
6. Engine-circulating oil temperature 140° to 150° F. entering cooler, 130° to 140° F. leaving cooler.
7. Fuel-pressure regulator pressure.
8. Engine-jacket cooling-water temperature entering engine should be maintained at optimum point for particular engine.
9. Cooling-water temperature entering and leaving engine and compressor (keep hourly record).
10. Spark advance. Normally full advance.
11. Drain starting-air receivers and starting-air header once per shift.
12. Compressor valves. Unit must be shut down at first sign (increased valve temperature) of valve breakage. Operation with broken compressor valve will cause serious damage to the compressor cylinders.
13. Compressor packing for blow-by.
14. Compressor cylinder-lubricator operation. Refill if necessary.
15. Mixing-valve oiler. Refill if necessary.
16. Oil-mixing-valve linkage.
17. Oil carryover on piston rod (an indication of the condition of the wiper rings).

For electric-motor-driven compressors, the operator should observe and/or record the following points during his shift:

1. Crankcase oil level. Keep record of quantity of oil added and hours operated between oil changes.
2. Force-feed cylinder and packing lubricators should be checked frequently for oil level. Keep record of quantity of oil added.
3. Compressor valves. Compressor must be shut down at first sign (increased valve temperature) of valve breakage. Operation with broken compressor valves will cause serious damage to the compressor cylinders.
4. Cooling-water temperature entering and leaving the compressor cylinders. (Keep hourly record).
5. Compressor packing for blow-by.
6. Compressor cylinder lubricator.
7. Oil carryover on piston rod (indication of condition of wiper rings).
8. Pour oil over bearings, crank pins, and crosshead pins of standby units daily where these units have splash lubrication of running gear parts.

Operating Precautions

For gas-engine-driven compressors,

1. Before barring over the engine, make sure fuel gas, ignition and starting air are "off" and compressor is unloaded.
2. If any work has been done on compressor, before turning it over with starting air, always bar the engine over by hand at least one revolution to make sure everything is clear.
3. If an engine shuts itself down for any reason whatsoever, turn fuel gas and ignition "off". Before again attempting to start make certain unit is unloaded and rotate by compressed air through two or three revolutions with ignition and fuel gas "off".
4. Always be sure cooling water is circulating through engine before attempting to start. In the event you neglect to turn on the water and start the unit first, do not then turn cooling water into engine, but shut down and allow the engine to cool before again attempting to start.
5. Never remove crankcase covers while engine is hot.
6. Cooling-water temperature should be maintained at 145° F. to the engine cylinders and 160° F. from the cylinders.
7. The cooling system should be drained during the shutdown periods if the machine is in danger of being exposed to freezing temperatures.

This material taken from process-training-program manual, Baton Rouge, La., refinery of Esso-Standard Oil Co.

PIPELINES

Plastic coverings—an effective approach to

Floating-roof performance from fixed-roof tanks

. . . in reducing evaporation losses

BY K. C. BOTTENBERG, Phillips Petroleum Co.

PLASTIC COVERINGS are being used within the petroleum industry to reduce evaporation losses from petroleum liquids stored in fixed-roof atmospheric tanks. These coverings float on the surface of the liquid contents and are an effective approach to obtaining floating-roof performance from fixed-roof tanks.

Small (nominal 0.001-in.-diameter), individual, hollow, plastic spheres, made of phenol-formaldehyde or urea-formaldehyde resins, are available for this purpose. In general, they are more effective on crude oil than on gasoline. Loss reductions in crude-oil service range from approximately 50 to 95% in static storage, and from approximately 0 to 85% in working storage.

A flexible, polyvinyl chloride plastic sheet fitted with a gridwork of small parallelepipedic floats of the same material is being successfully used in Europe. This blanketing material is reported to reduce breathing losses and filling losses in the order of 90% on crude oil and 60 to 95% on gasoline.

A rigid blanketing material made of urethane foam is being developed in the United States. It is anticipated that it will reduce breathing losses and filling losses approximately 90%.

Small plastic spheres . . . The preferred method of installing plastic spheres in a storage tank is to aspirate the dry spheres into some of the fluid being pumped into the tank. A schematic diagram of such equipment is shown in Fig. 1. After being injected into the tank and the fluid allowed to stand static for a while, the spheres float to the surface to form a foam-like, flexible surface covering.

The spheres also may be installed by mixing a slurry of the spheres with a portion of the fluid to be stored in the tank and pumping the slurry into the tank. This method has the disadvantage that some of the spheres will be crushed in passing through the pump.

A third method of installing the spheres is to dump the dry spheres into the tank from a top manhole or gaging hatch. By this method it is more difficult to obtain even distribution of the spheres over the surface of the liquid than by the other two methods. When the spheres drop several feet through air there is the possibility of developing a dust-explosion hazard.

A number of test and permanent installations have been made within the petroleum industry. Some installations have been conducted on a rigorous basis, others are essentially equivalent to a stock-loss report. A great deal of information from such installations has been made available to the API Evaporation-Loss Committee for analysis and evaluation. From such analyses and evaluations, the following are indicated:

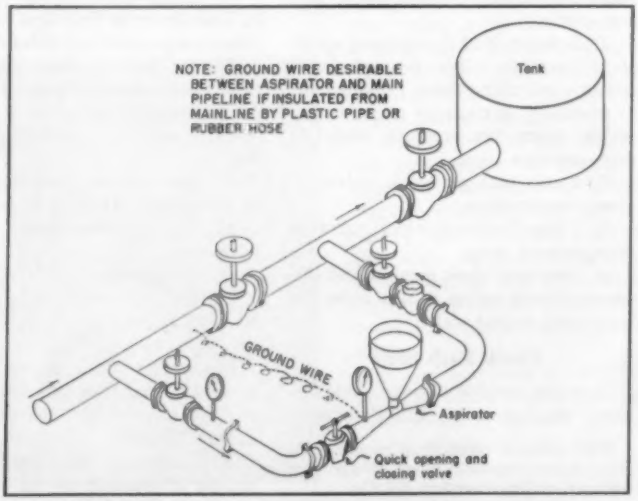
A. Crude Oil in Static Storage

With blanket coverings of nominal ½-in. thickness or greater, evaporation losses may be reduced from 50 to 95%.

B. Crude Oil in Working Storage

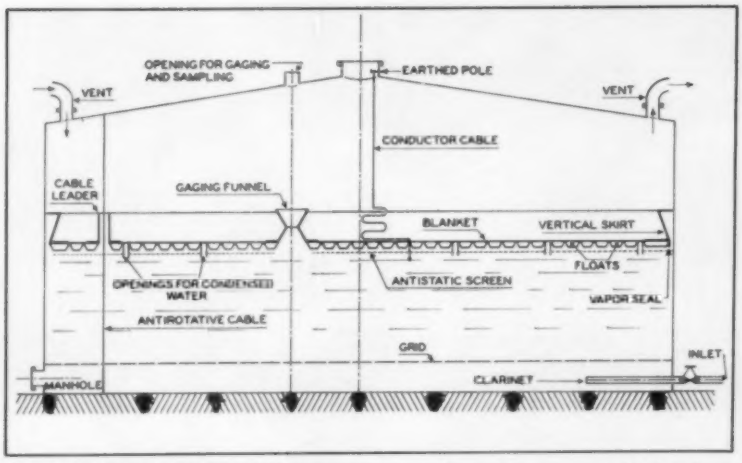
1. With blanket coverings of 1 in. or greater, evaporation losses may be reduced 0 to 85%.

2. Minimum inventories must be kept high to prevent disturbing the


NOTE: GROUND WIRE DESIRABLE BETWEEN ASPIRATOR AND MAIN PIPELINE IF INSULATED FROM MAINLINE BY PLASTIC PIPE OR RUBBER HOSE
Tank
GROUND WIRE
Aspirator
Quick opening and closing valve

PIPING DIAGRAM for injection of plastic spheres makes use of an aspirator for drawing spheres into the line. Fig. 1.

Paper presented at API Evaporation-Loss Committee meeting, Houston, 1958.



PLASTIC-BLANKET INSTALLATION is simple; yet provision is made for long, trouble-free operation. Fig. 2.

blanket by pumping product into or out of the tank.

3. The elapsed time between the completion of filling and the start of tank emptying must be sufficient to allow the blanketing material, disturbed and dispersed into the liquid by the filling operation, to reestablish itself on the liquid surface. Otherwise, part of the blanketing material will be withdrawn with the product.

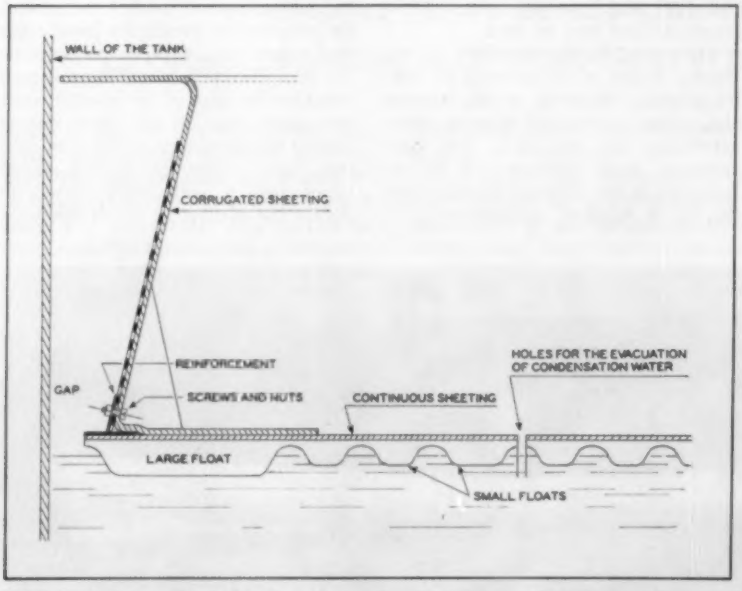
C. Natural Gasoline in Static Storage

In trial installations the plastic spheres dispersed in the gasoline rather than forming a protective blanket. In one instance (stabilized natural gasoline from a glycol-type separation unit), the plastic spheres sank, apparently because of wetting with water or a water-glycol mixture.

D. Motor Fuel

1. In static-storage tests the loss reductions were indicated to be zero, or perhaps increased at high inventories. At one-third inventory, a loss reduction of 10 to 30% may be indicated.

2. Working-storage tests indicate loss reductions in the order of 25 to 40% when an adequate minimum inventory and adequate elapsed time before product withdrawal are observed. As a general guide, the tests reported indicate that a minimum inventory of 12 ft. and an elapsed time of 24 hours before product removal after filling or working a tank will give uniformly satisfactory results in maintaining a continuous (effective) blanket.



EDGE SEAL for a plastic blanket shows detail of large edge float and vertical skirt. Fig. 3.

It is not intended to imply that these minima are absolute for all installations and conditions. Each installation and its operation will be different from another; experience may show the minimum for these factors to be appreciably lower in many instances.

3. The tendency for the spheres to suspend in liquid gasoline necessitates the use of filters or other satisfactory means to prevent dispensing these spheres into retail gasoline outlets.

E. General

1. It is reported that because of moisture from tank bottoms suspended in the product or because of condensation dripping from the underside of the roof coming into contact with the phenol-formaldehyde or urea-formaldehyde plastic spheres, some of them may sink.

2. There is indication that the plastic-sphere blankets may be relatively ineffective at temperatures below approximately 40° F.

3. The blanket thickness indicated as desirable by experience and the probable loss reduction which might be expected when assuming favorable conditions are as follows:

	Loss reduction* (per cent)	Blanket thickness (In.)
Crude oil		
Static	70-90	0.5
Working	50-70	1.0
Motor gasoline		
Static	0-30	1.0
Working	30-50	1.0-2.0

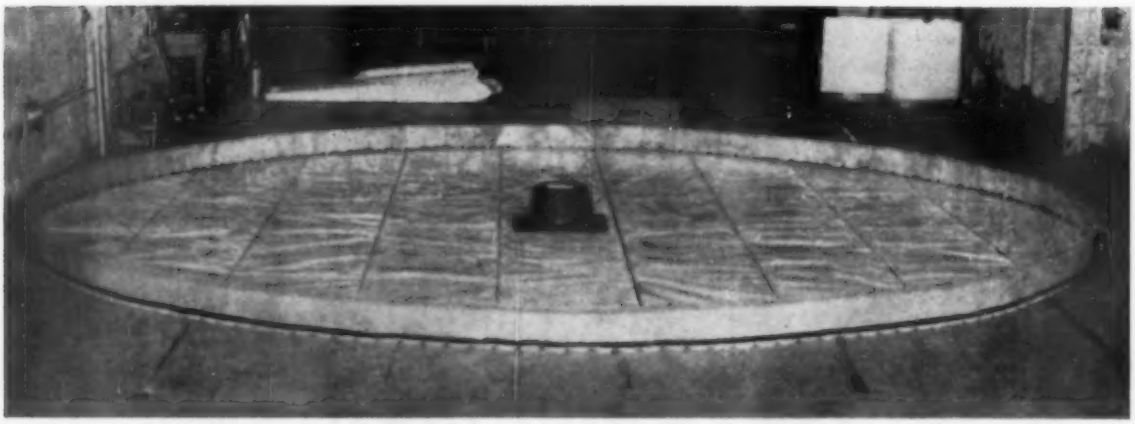
*Hydrogen sulfide (H_2S) concentration in the vapor space can be expected to be reduced a corresponding amount. One test indicated a two-thirds reduction in corrosion rate.

4. Considerable discretion must be exercised with respect to pumping rates into or out of storage tanks or the operation of mixers in tanks, to keep disturbance of the blanket of plastic spheres at a reasonable minimum. Disturbing the blanket tends (a) to leave uncovered areas on the liquid surface, thereby reducing blanket effectiveness; and (b) to suspend the spheres in the liquid so that they may be removed from the tank with the product.

5. Blanket life appears to vary with the type of service, how the tank is worked, and the type of product in the tank.

6. A certain amount of wall clingage of plastic spheres occurs in working crude-oil or gasoline tanks. This, in part, explains the necessity for the use of thicker blankets on working storage than on static storage to obtain effective evaporation-loss reduction.

7. Although estimates can be made as to whether or not there is a reason-



ASSEMBLED PLASTIC BLANKET shown here is ready for installation in a tank. Fig. 4.

able possibility that the use of a plastic-sphere blanket may be of economic benefit in reducing evaporation losses under a predicted set of operating conditions, it is indicated that trial under anticipated operating conditions is advisable before embarking upon extensive use.

Small plastic spheres are particularly applicable to crude oil in static or working storage when proper precautions are taken to keep disturbance of the blanket at a reasonable minimum. Keeping disturbance of the blanket at a reasonable minimum is usually accomplished by maintaining a high minimum inventory and allowing sufficient time for the dispersed blanket material to reestablish itself on the liquid surface before pumping product from the tank.

The inefficient use of tank capacity imposed by a high minimum inventory must be considered in evaluating the economic advantages of the evaporation-loss reduction effected by a plastic-sphere blanket.

Plastic Blankets

Plastic blankets which will float on crude petroleum or its products, normally liquid at atmospheric conditions, have been developed in France and the United States. The French blanket is constructed of polyvinyl chloride, although other plastics with suitable characteristics may be used.

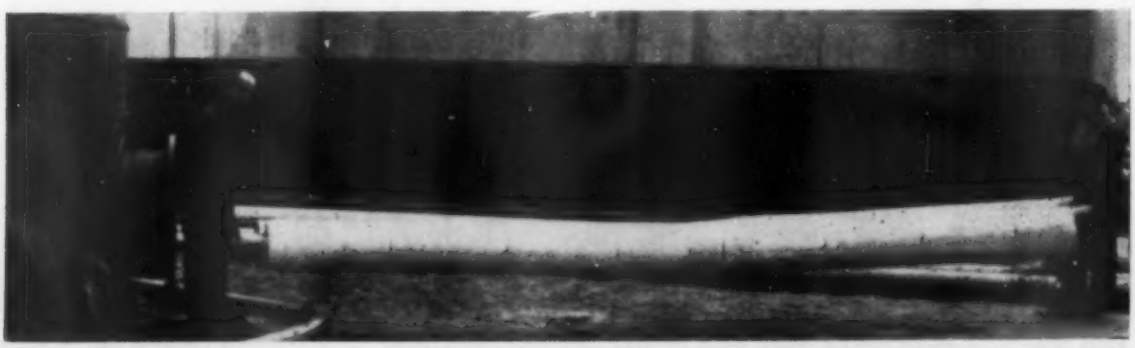
GAGING FUNNEL, which is built right into the blanket, has flexible diaphragm. Fig. 5.

The plastic blanket developed in the United States is constructed of urethane foam. However, in this instance also, other plastics of suitable characteristics may be used. For convenience, these blankets will be referred to as the "French blanket" and the "U. S. blanket," respectively.

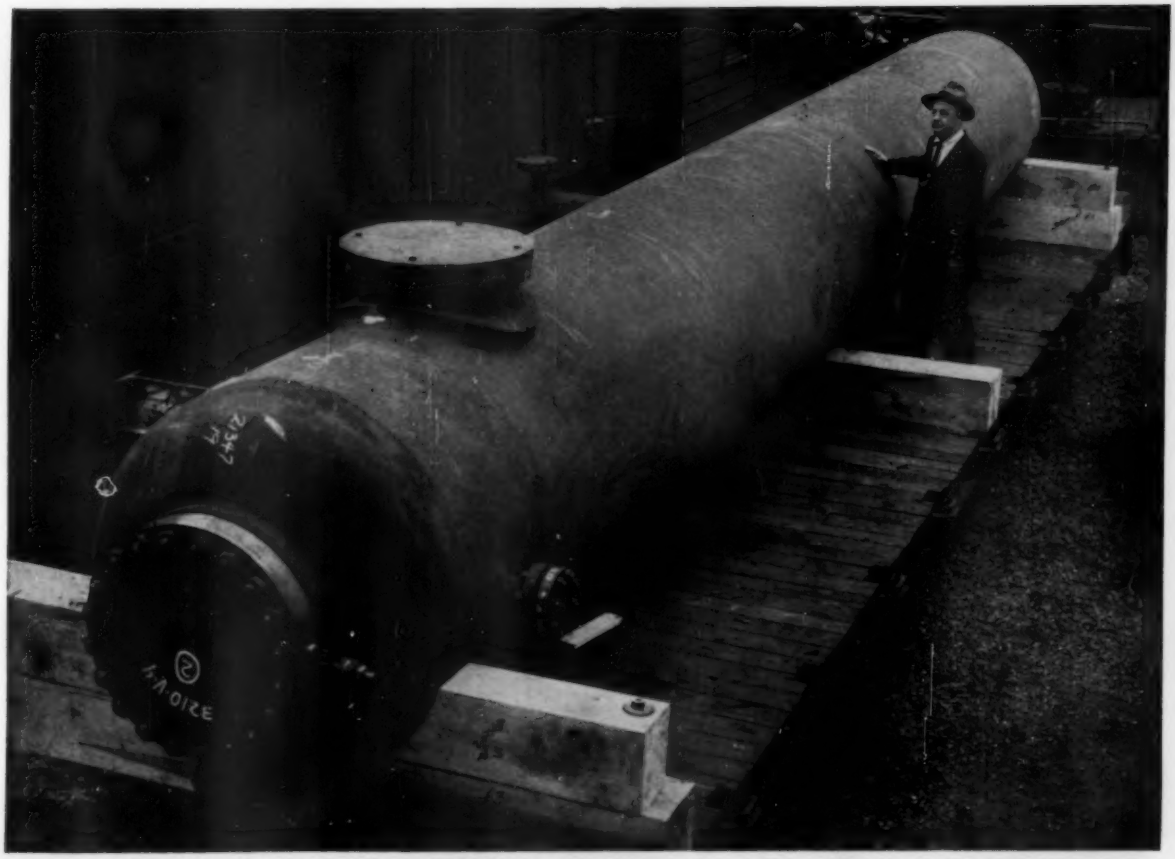
French blanket . . . The blanket developed in France is being used in Europe and Africa to reduce evaporation losses from volatile liquids stored in fixed-roof storage tanks. According to the manufacturer, such blankets have been successfully used on crude petroleum, gasoline, motor spirits, alcohol and mixtures of alcohol, gasoline, and benzol. More than 100 installations have been made in Europe and Africa. A few test installations have been made in the United States.

The French blanket is in the form of a continuous, flexible, polyvinyl chloride sheet, the underside of which is provided with a large number of small parallelepipedic floats arranged side by side (see Figs. 2 and 4). The floats are of the same material as the blanket and are bonded to the blanket.

The blanket is made to cover the free surface of the liquid in the tank, except for approximately 1 in. around the periphery to permit the installation of a vapor seal. A vapor seal consisting of a Z-shaped, raised skirt is provided on the edge of the blanket, with the upper edge of the skirt resting against the inner edge of the tank wall (see Figs. 2 and 3). The Z-shaped vapor seal is sufficiently elastic to permit the blanket to travel freely up



DURING INSTALLATION, blanket is rolled and taken into tank through a manhole. Fig. 6.



NEWPORT NEWS BUILT two 39'-7" horizontal gas scrubbers, such as this, for J. F. Pritchard & Co. They were made of ASTM-A212 Grade B fire box steel, with structural mesh steel interiors.

Gas scrubber made of 2⅞" steel

Newport News builds almost any type of pressure vessel and other heavy process equipment

Here is one of two horizontal gas scrubbers recently built for an operating pressure of 1800 psi at 300°F.

Newport News made both vessels from fire box steel, 2⅞ inches in thickness. We formed and automatically welded this steel into sections having a diameter of only 4 feet.

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ROLLING 2⅞" STEEL for gas scrubbers. The steel, in a hot condition, was formed on the heavy bending equipment shown here. It will cold roll mild steel up to 3 inches thick, and will hot roll any grade of steel up to a thickness of 5 inches.

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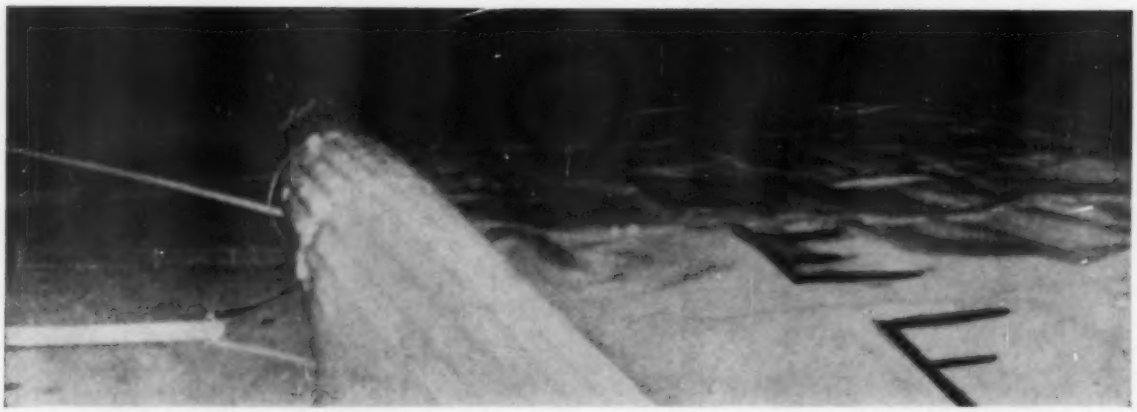

UNROLLING THE BLANKET inside the tank. Fig. 7.

RIGID-TYPE BLANKET, made from polyisocyanates, has low density, high load-carrying capacity. Fig. 8.

and down with the liquid surface, without lodging on rivets or tank-wall irregularities.

The blanket is provided with a certain number of openings fitted with vertical sleeves to permit measuring and sampling operations upon the tank contents (see Fig. 5). The plastic blanket may be used as a means of indicating the liquid-level location in a tank.

A wire gridwork attached to the tank walls is fitted under the blanket to prevent it from dropping below the fill nozzle of the tank. Small holes are provided in the blanket approximately every square yard to permit the water of condensation to drain through.

The French blanket is manufactured in sections for ease of handling and to permit the introduction of the blanket into a tank through existing manways (see Figs. 6 and 7). The sections are fitted together and fastened by a simple zipperlike method to form a continuous blanket inside of the tank. Manufacturing the blanket in sections simplifies fitting the blanket to tank structural supports.

According to the manufacturer, breathing and filling-loss reductions with the French blanket are in the order of 90% on crude oil and 60 to 90% on gasoline. For crude oil this reduction is comparable to that observed with the use of the individual, small, hollow plastic spheres in some applications. Limited tests on gasoline in the United States indicate loss reductions of approximately 90 to 95%.

The French blanket is applicable to a wide range of density of petroleum products which are liquid at normal atmospheric conditions. The French type of blanket can be expected to be more effective on gasoline-type materials than are the small, hollow plastic spheres. It appears that such blankets may be advantageously applied to small gasoline bulk-station tankage and small tanks in crude-oil lease-tank batteries.

Foldover . . . This was observed in some of the tests on the French blanket in the United States. The blanket manufacturer reports that this has been overcome by adding a torus (doughnut)-shaped, inflatable plastic tube near the periphery, circling the outer edge of the blanket. This serves as a stiffening member, wherein the stiffness can be varied by the degree of tube inflation.

The manufacturer also recommends that the tank fill nozzle be extended for several feet inside the tank and that it be slotted. Most of the foldover trouble was traced to slugs of air or gas which had been pumped into the tank along with the liquid and released under the edge of the blanket, causing the edge to be forcefully and violently tossed upward.

The extended and slotted fill nozzle allows these slugs to be more evenly dispersed and dissipated under the whole blanket.

Blanket sizes of more than 17 ft. in diameter are provided with an antistatic screen to collect and dissipate electrostatic charges which may develop during pumping of the tank liquid. This device is made of a continuous, metallic stainless-steel cable, closely attached under the floating plastic blanket in parallel lines and connected to the tank shell by means of a flexible cable.

Vertical cables attached to the tank roof, passed through the blanket, and anchored to weights or fastened to the tank bottom, are used to prevent the blanket from rotating. The blanket life is estimted to be well over 10 years.

U. S. blankets . . . A rigid foam type of blanket is currently undergoing development tests in the United States. It is designed to reduce evaporation losses from vertical cylindrical tanks with self-supported roofs and diameters of 20 ft. or less. The blanket is

it's

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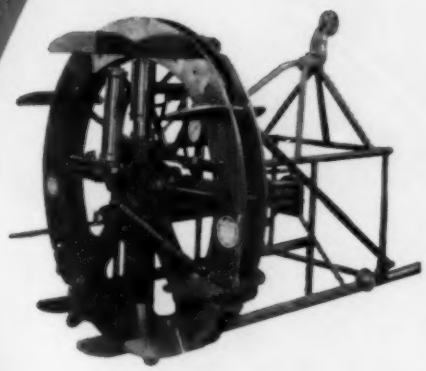

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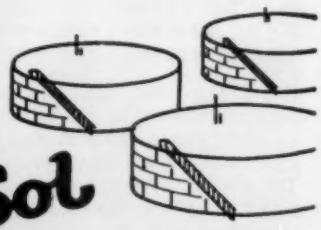

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NEOPRENE-FOAM LOOP SEAL, used around blanket's edge, here works over a projecting structural member. Fig. 9.

particularly adaptable to lease tanks, production tanks, and vertical marketing or bulk-station tanks.

The synthetic foam of the rigid types is made from polyisocyanates. The foam consists predominantly of closed cells which make sinking impossible. The material has a low density, a high-load-carrying capacity (see Fig. 8), and is fully resistant to hydrocarbons and water.

Foam segments . . . The blanket consists of multiple, pie-shaped foam segments which are interlocked in position with a tongue-and-groove joint. The foam segments are precast and baked at the proper temperature to obtain the most desirable characteristics. A molded-in-place, flexible neoprene foam loop provides an effective edge seal which exerts an inward centering force (see Fig. 9).

The seal is effective for tanks 6 in. larger or smaller than the specified nominal diameter. The segments are available for nominal diameters in increments of 12 in. The segments are formed with a slight slope toward the outer rim, to automatically drain water or other fluid collecting on the top side of the blanket. The average thickness of the blanket is approximately 1½ in.

The pie-shaped foam segments are sized to pass through an 18-in.-diameter manhole and are assembled inside the tank. Installation can be made with the tank in service. However, it is preferred that the tank be emptied and cleaned before installation. This permits inspection of the tank and correction of structural members with excessive projections into the tank which may interfere with the operation of the blanket.

Automatic operation . . . Inasmuch as the blanket floats, its operation is automatic. Gaging may be accomplished by providing a neoprene-sealed gage hole through the blanket, or the blanket may be used as a means of indicating the liquid-level location in the tank. Blankets on tanks to be gaged or thiefed must be stabilized from rotation with a vertical wire. The wire may be attached to the gage hatch and passed through a plastic tube inserted in the blanket and anchored to a weight or fastened to the tank bottom.

Tests are still in their preliminary stages. However, the rigid plastic foam blanket should be approximately 90% effective in eliminating breathing and filling losses from average motor gasolines.

Because the rigid plastic foam blanket is a new development, no long-term life tests are available. Accelerated laboratory tests indicate a probable long life, perhaps 10 years or more in gasoline service.

Like the French blanket, the U. S. blanket is more effective in gasoline service than are the small plastic spheres. The U. S. blanket can be readily removed from a tank for reuse elsewhere if desired.

Plastic pillows and forms . . . Heat-sealed, hollow polyethylene pillows and cross-shaped, expanded polyethylene floats are commercially available for application to liquid surfaces in open or fixed-roof tanks for reducing evaporation losses. Their use

". . . the rigid plastic foam blanket should be approximately 90% effective in eliminating breathing and filling losses from average motor gasolines."

has apparently been primarily on aqueous solutions of chemicals in open tanks or vats.

For the expanded floats on water in an open vat under the normal atmospheric conditions in a shop, the manufacturer claims an evaporation-loss reduction up to 75%. Tests on crude oil under similar conditions resulted in evaporation-loss reductions of 20 to 30%.

No data are quoted by the manufacturer for the polyethylene pillows.

Safety . . . The use of blankets, which are effective in reducing evaporation losses, over the liquid surface of petroleum products will reduce the hydrocarbon concentration in the vapor space of fixed-roof atmospheric storage tanks. Compared with the unblanketed condition, this changes the degree or frequency of operation of the vapor space in the explosive range. Inasmuch as the hazard exists in either case, then, with proper adherence to recommended safe practices, the problems in safe operation of blanketed tanks are not appreciably different from those experienced with unblanketed tanks.

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AN EMERGENCY water line from the Arkansas River to Augusta and El Dorado, Kans., and three refineries in the area was recently filled with nitrogen to prevent internal corrosion.

The 16 and 18-in. line, 32 miles long, was filled with gaseous nitrogen and sealed at both ends to keep oxygen out of the line and maintain it ready for use in a future emergency. A mobile pumping unit of Linde Co., division of Union Carbide & Carbon Corp., completed the operation in 50 hours.

The unit carries the nitrogen in liquid form and a built-in converter changes it to gas for pumping into the line. The nitrogen purged water and air from the line and remained as a blanketing agent for corrosion protection. Some 250 M.c.f. of nitrogen was pumped into the line.

The first truck load of nitrogen was hooked to a 1½-in. valve and pumped into a 9-mile section on one end. The next day a 14-mile section was filled at the other end. The third day the 9-mile middle section was filled. With this preparation the line can be taken out of moth balls and returned to service immediately without cleaning and reconditioning.

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TULSA, OKLAHOMA

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

Steam generation by waste-heat boilers

THE VALUE of the steam generated by waste-heat boilers is usually credited to the process operation that supplies the heat for the boilers, and this practice is followed throughout this series. However, note that even a larger credit might be given because little or no labor is required in generating the waste-heat steam, slightly less maintenance is required (than for the customary housed boiler installation), the cost of waste-heat boilers is usually a little less than the cost of complete boiler installations, and they eliminate the need of coolers for the hot process streams. The last of these is somewhat questionable because the hot streams might be utilized by heat exchangers rather than requiring coolers. All of these items constitute a reduction of steam-generating cost of 2-5 cents per 1,000 lb. during 1956 (see Process Costimating No. 18, June 30, 1958, p. 103):

	Cents per 1,000 lb.
Labor saving (half)	1.5
Fixed charges reduced, zero to 75%	0-3.6
Total cost reduction	2-5

Thus an additional credit of 5-10% of the value of plant steam might, under some circumstances, be allowed. Finally, no general method is possible for evaluating the very great saving arising from the use of smaller fractionators, vessels, etc., in the parent process equipment, but no specific reduction in steam cost can be adopted for such benefits.

The amount of surface required to generate steam is vitally dependent on the film conditions on the heating side of the tubes. Film-transfer rates for the boiling water are quite high (500-1,000 B.t.u. per sq. ft.-hr., °F.), and the maximum flux rate (heat-transfer rate times MTD) is 20,000 to 25,000 B.t.u. per hour. On the other side of the surface, however, fouling may be severe and the heating fluid may have a poor transfer rate (especially gases), resulting in the over-all transfer rates and surface requirements indicated in Fig. 1. The approximate cost of surface (installed and complete with drum, pump, etc.) is indicated in Table 1.

TABLE 1—APPROXIMATE COST OF INSTALLED WASTE-HEAT BOILERS (1946)*

Surface (sq. ft.)	Installed cost (dollars) Total	Per sq. ft.
2,000	11,000	5.50
3,000	15,900	5.30
5,000	25,000	5.00
8,000	39,000	4.87
15,000	69,000	4.60

*Chilton, C. H., Chem. Eng., June 1949, p. 97, but reduced from May 1947 costs to 1946 costs by dividing by 1.16.

PROCESS COSTIMATING ISSUES PERTAINING TO STEAM*

No. 8—April 14, 1958—Fuel and Steam—for Processes
No. 9—April 21, 1958—Fuel and Steam—Refineries
No. 12—May 12, 1958—Fuel and Steam—Refineries
No. 13—May 19, 1958—Steam and Electrical Requirements
No. 17—June 23, 1958—Cost and Reuse of Steam
No. 18—June 30, 1958—Average Cost Since 1932
No. 19—July 14, 1958—Byproduct Power
No. 20—July 21, 1958—Waste-Heat Boilers
No. 21—July 28, 1958—Reciprocating Pumps

*In addition, at least four issues on process and jet steam.

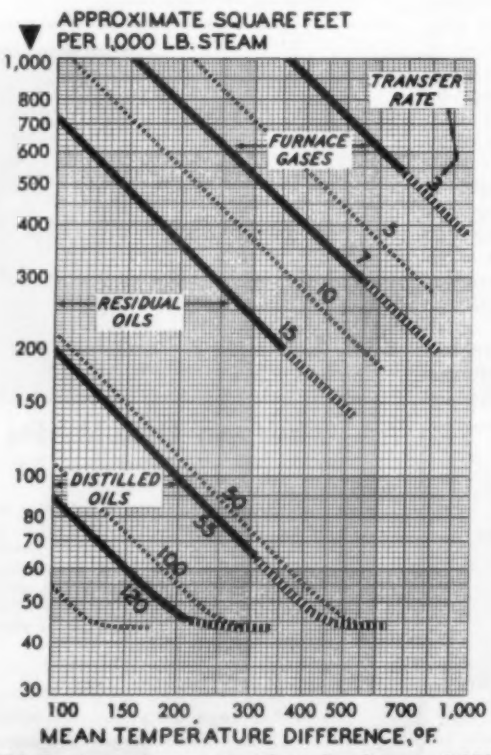

FIG. 1—Approximate square feet of surface per 1,000 lb. steam generation required for waste-heat boilers.

Installation costs are relatively low when distilled oils (high-transfer rate) are used as the heating medium, but the cost of the installation (and fixed financial charges in operation) rises to more than that of conventional boilers if flue gases are the heating medium. Thus at 600 sq. ft. of surface per 1,000 lb. of steam (see Fig. 1), the cost of the installation may amount to $3,000 (or about $5,400 for 1956) whereas regular boilers cost only $1,250 to $2,000 (complete) depending on the size. (Costimating No. 14, July 16, 1956, pertains to the cost of steam-generation equipment.) Exactly the opposite occurs with more favorable heating mediums, resulting in installation costs of only $500 or less. Again, note that the installation of a waste-heat boiler eliminates the need of some other equipment for cooling the hot stream.

BY W. L. NELSON
Technical Editor and
Petroleum Consultant

References—Adsorbent clays, earths, and catalysts

Can you please give me references about clays, earth, and catalysts—kinds, how made, and physical and chemical properties of various trade-name materials? H.J.Z.

The business of mining, purifying, treating, and manufacturing clays and catalysts is so small that few details have been published. The books "Adsorption", by Mantell (McGraw-Hill Book Co., Inc., New York) and "Chemical Refining of Petroleum" by Kalichevsky and Stagner (Reinhold Publ. Corp. N.Y.) may be helpful. Many references are listed in the first, second, and third editions of "Petroleum Refinery Engineering," by Nelson (McGraw-Hill Book Co., Inc., N.Y.). Selected references from the literature are:

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Fire point—its significance

Why do we bother with "fire point"? We never seem to use it. S. Wm. T.

Little can be learned from the fire point and in recent years it is seldom reported in oil analyses. The relation of "flash point" to fire point (see Fig. 1) indicates something about the degree of fractionation or steam stripping that has been practiced in producing the oil, and to a lesser extent, whether the oil is a narrow-boiling-range fraction or a blend of several lube stocks. The average difference in temperature between the flash point and the fire point, according to Fig. 1, is about:

Flash, °F.	Fire, °F.	Difference
300	350	50
400	458	58
500	566	66
600	675	75

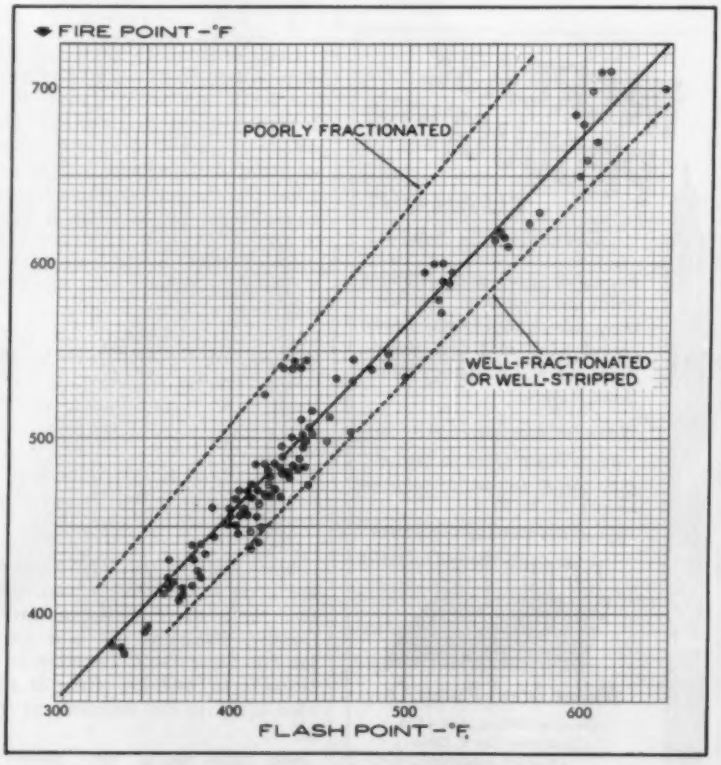

Fig. 1—Relationship between open-cup flash and fire points.

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Drilling begins on eight-well Denver basin contract

ONE OF THE LARGEST drilling contracts reported in the Denver-Julesburg basin in the past year has been awarded to Sterling Drilling Co.

It involves the drilling of eight wells for Plains Exploration Co. All will be exploratory wells spread over five townships in northwestern Washington County and across the line in northeastern Morgan County. This area is adjacent the southwest corner of Logan County, and northwest of Messex field, and southeast of Merino field.

Drilling already is under way on the first of the eight wells. It is Plains' 1 Fritzler, in 28-6n-55w, in Morgan County. It is about 2 miles northwest of Messex field. Four more of the already announced locations are on the Morgan County side of the line. Three are in Washington County. Location of the eighth well has not been determined.

Who's getting the drilling contracts

Southland Drilling Co. is drilling for Kilroy Co. of Texas, Inc., and F. A. Callery, Inc., at a new deep operation in the Palacious area, southwestern Matagorda County, Texas Gulf Coast. Its location is 4 miles northeast of town at 1 Lovering, in the Sam Parks Survey. Operators plan a 9,500-ft. test.

Clegg & Hunt, Houston, will drill a deep wildcat test for El Paso Natural Gas Co. in western St. Landry Parish, South Louisiana. Location, at 1 Doucet, in 74-4s-3e, is about 5 miles southeast of Ville Platte field, in Evangeline Parish, nearest present production. Permit provides for a 12,000-ft. test.

Glasscock-Wilson, Inc., Shreveport, will be the contracting firm on another deep exploratory test Aladdin Oil Co., of New Orleans, is undertaking 5 miles northeast of La Pice field, in St. James Parish, southeastern Louisiana. The new operation, 2 Waguespack, in 12-11s-3e, is about 1,200 ft. from Aladdin's initial test on the lease. The latter was a 11,500-ft. dry hole.

Haco Drilling Co., Oklahoma City, has a rig working on a wildcat location west of Purcell, in McClain County, Oklahoma. It is a contract job for Gene Goff. Location is at 1 Norvell, in 3-6n-2w. Hole is scheduled to go to the Bromide, or 8,400 ft.

Miller & York, Bakersfield, Calif., will drill another well for Kern Oil California, Ltd., in the Mountain View field, southeast of Bakersfield, where it recently completed an oil-discovery well in a 7,000-ft. Nozu sand. Rig for the new operation is coming from West Bellevue, where it has been drilling for Norris Oil Co.

Aldridge & Stroud, Odessa, Tex., contractors, are to drill a wildcat test in Antelope Springs Valley, in Mohave County, northwestern Arizona. Operators will be C. C. Harrison, of Los Angeles, and Tony Lyons, of Holdenville, Okla. Location is in 35-39n-6w, in the general area of three other wildcats drilled by other operations in recent months. All have reported oil and gas shows.

Mountain States Drilling Co., Denver, is getting started on a new Tensleep contract in the Long Creek area, 35 miles southeast of Lander, in Fremont County, Wyoming. It is drilling for Halbert & Jennings at 1 Shannon-Government, in 32-32n-94w. Objective is expected about 5,600 ft.

Noland Drilling Co. has a rig working for El Paso Natural Gas Co. on a distant wildcat location about 35 miles east of Grand Junction, in Mesa County, western Colorado. Location is at 1 Leon Creek, in 29-10s-93w.

Olds & Wrather Drilling Co., Casper, has a rig running for Petroleum, Inc., and Properties, Inc., on a wildcat location in western Campbell County, in the Powder River basin of northeastern Wyoming. Location, at 1 Nisselious, in 33-48n-74w, is about 10 miles southeast of the Dead

there's something new in Packers!

Where there is a need... Baker shows the way. Recognizing a need for an economical, retrievable and yet dependable packer for water flooding and other pressuring applications in shallow or low fluid wells, Baker engineers have come up with the new Model "A" Tension Packer.

Compact design makes the big difference in this new packer. Imagine the ease of shipping, storing and handling a packer less than 30″ long. Its size is deceptive, for it contains many field-tested features of Baker retrievable squeeze tools.

For example, there's a "full bore" to permit the passage of instruments through and below the packer; a proven packing element that assures positive pack-off; and *rocker-type slip units* that eliminate cumbersome drag springs, slip tie-links, and guide grooves. For simplicity of operation, there's the reliable J-Slot setting and release mechanism.

Get to know the Model "A" better. There *is* something new in packers, and your Baker man has all the facts. Call him for information on how the Baker Model "A" Tension Packer can solve *your* hook-wall packer needs, or write for Bulletin No. 334.

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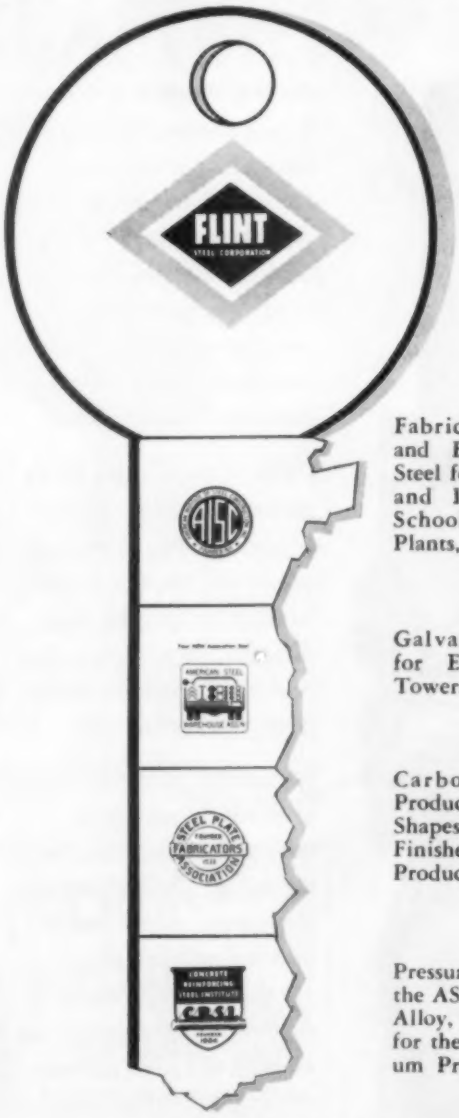
TENSION PACKER



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Horse Creek area, nearest production.

Comet Drilling Co., Lafayette, La., is under contract to Lamson & Bennett, also of Lafayette, for a 11,500-ft. test in the Boudreaux area, on Bayou Grand, 15 miles south of Houma, in Terrebonne Parish, southeastern Louisiana. Location is in marshes on the west shore of Lake Boudreaux.

Trant Drilling Co., Tyler, Tex., has a new deep wildcat operation in northeastern Hopkins County, East Texas. Drilling is for Dick Scott and associates, of Dallas, who have permit for a 9,600-ft. test. The Smackover formation is the objective. Location, at 1 Williams Raines Estate, is about 4 miles southwest of Sulphur Bluff. It is 1½ miles west of Paluxy production in Sulphur Bluff field, and about 3½ miles southwest of a 9,300-ft. Smackover gas-discovery well completed last April by Grelling Estate.

South States Drilling Co., Longview, Tex., is getting started on a contract it has with E. R. Jackson and Maxwell D. Simmons, also of Longview, for an 8,000-ft. Travis Peak test 4 miles southeast of Kilgore, in northern Rusk County, East Texas. Location is on a Lone Star Producing Co. lease in the Henry Wells Survey.

United Drilling Co., Longview, Tex., is on a new wildcat operation northwest of production in Northwest Slocum field in Anderson County, East Texas. It is a contract job for Tom Cook, Jr., Longview independent. Location is on Cook's Tucker Royall Estate lease. It is about 2½ miles northwest of Slocum. Contract is for 5,300 ft. to test the Woodbine.

Jett Drilling Co., Shreveport,, has the contract on a deep wildcat test Central Oil Co. and Lone Star Producing Co. are undertaking in northeastern Jones County, southeastern Mississippi. Operators plan a test through the Lower Cretaceous-Rodessa section to a depth of 11,500 ft. Their location, at 1 Masonite, in 25-10n-10w, is about 10 miles northeast of Laurel, 4 miles east of Sandersville field, and about the same distance west of West Eucutta field.

Field Drilling Co., San Antonio, is drilling for Lone Star Producing Co., of Dallas, at a wildcat location in the Reiser area, 3 miles west of Aguilares, in Webb County, Southwest Texas. It is a 5,600-ft. contract. Location is at 1-A Martin.

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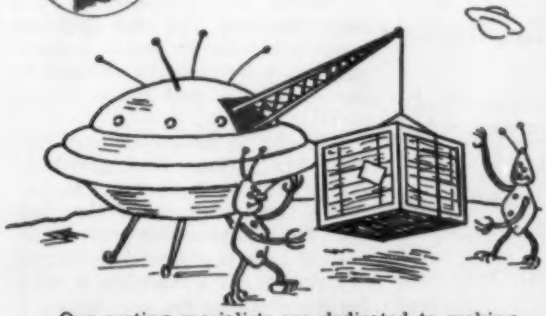

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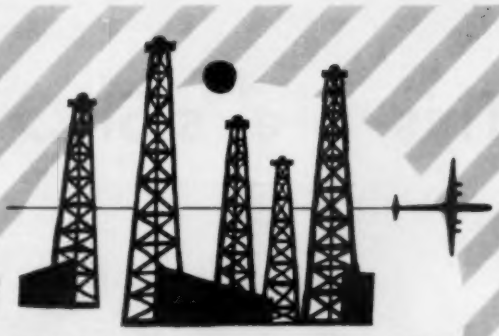

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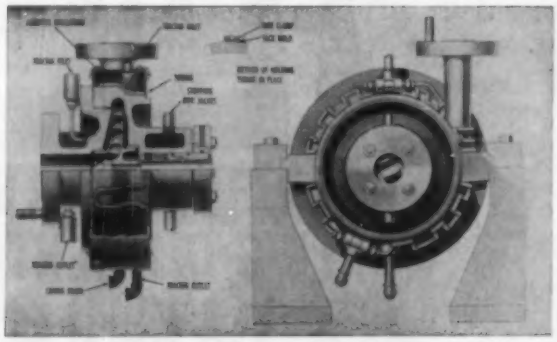
This week's SHOWCASE features . . .



Pump for liquids that solidify

. . . or crystallize with loss of heat is designed to transfer heat to the liquid as it passes through the pump. Waxes, tars, and heavy petroleum liquids can be moved with the "Constant Temperature" pump, according to the maker.

Heat transfer is accomplished by tracing the casing and either tracing or jacketing the suction nozzle. The stuffing box is jacketed. The heat-transfer medium is simply passed through this jacket to prevent possible solidification of the pumped liquid in the packing or mechanical seal.

The constant-temperature pump comes with either cast-steel, iron-fitted or Type 316 stainless-steel parts contacting the pumped liquid. **Write or call: Dean Brothers Pumps, Inc., 323 West Tenth Street, Indianapolis 7, for details on constant-temperature pumps.**

●

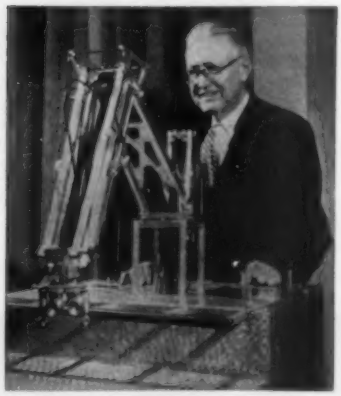
Accumulator unit acts fast

. . . to close blowout preventer. The new 40-gal. accumulator unit is called the Wildcat 40. A high-pressure pump is used for fast accumulator charging and preventer operation in case of accumulator failure.

Measuring 10 by 5 by 3 ft., the complete unit consisting of pumps, accumulators, control equipment, and fluid tanks is skid-mounted for easy handling during transport and at the rig.

According to the maker, the unit is completely automatic and simple to operate. Only 100 psi. air pressure is needed for preventer operation. Components include the pump, two 20-gal. float-type accumulators, a fluid-control manifold, automatic pressure-control switch, 80-gal. fluid tank, and 10,000 psi. gages. The unit is designed for 80-gal. accumulators without changing any of its dimensions. **Write or call: Carthage Tool Co., Carthage, Tex., for details on 40-gal. accumulator unit.**

●



New rig automatically conveys hose

. . . for oil from the dockside to a ship's manifold. The rig's operating principle is based on that of a pantagraph. It is hydraulically operated by one man at a push-button control panel.

With the rig, an operator can steer two 12-in. oil-hose lines directly to the manifold in 3 minutes. This permits a faster "turnaround" for tankers. Too, oil-hose life will be increased as it is protected by the rig.

United States Rubber Co. is offering the plans for the unit, known as the Amazon rig, to the oil industry generally, without charge. The rig's cost will vary according to modifications of the basic plan. Installation cost is estimated at $40,000. The rig will weigh 22 tons. This does not include the two lines of wire-cord oil-suction and discharge hose. The rig will be 42 ft. tall, not including the substructure. **Write or call: United States Rubber Co., 1230 Avenue of the Americas, New York 20, for details on new automatic rig.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

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Described in OIL AND GAS JOURNAL - Issue of July 21, 1958

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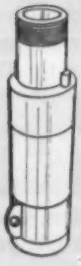
Theo N. Law, Falcon Seaboard's diesel electric, submersible drill barge, equipped with Goodall Rotary Hose.

R. Goodall Rotary Hose

prescribed when only the best is good enough



For example, Falcon Seaboard could not afford less than the best rotary hose for their shallow-water drill barge. Consequently, Goodall Rotary Hose was selected to be used on the barge's 1500 hp mud pump—the largest on the market. The Theo N. Law was still on location and drilling beyond 14,987 feet when last reported. Guaranteed Goodall Rotary Hose continues to give dependable performance.

For a rotary hose that will withstand the highest drilling pressures produced on any rig now in use—specify Goodall. It's good economics, because only Goodall hose has these outstanding features:

The Barney Coupling — The Goodall Safety Clamp — The Goodall Repair Service
The Goodall One-Year Guarantee

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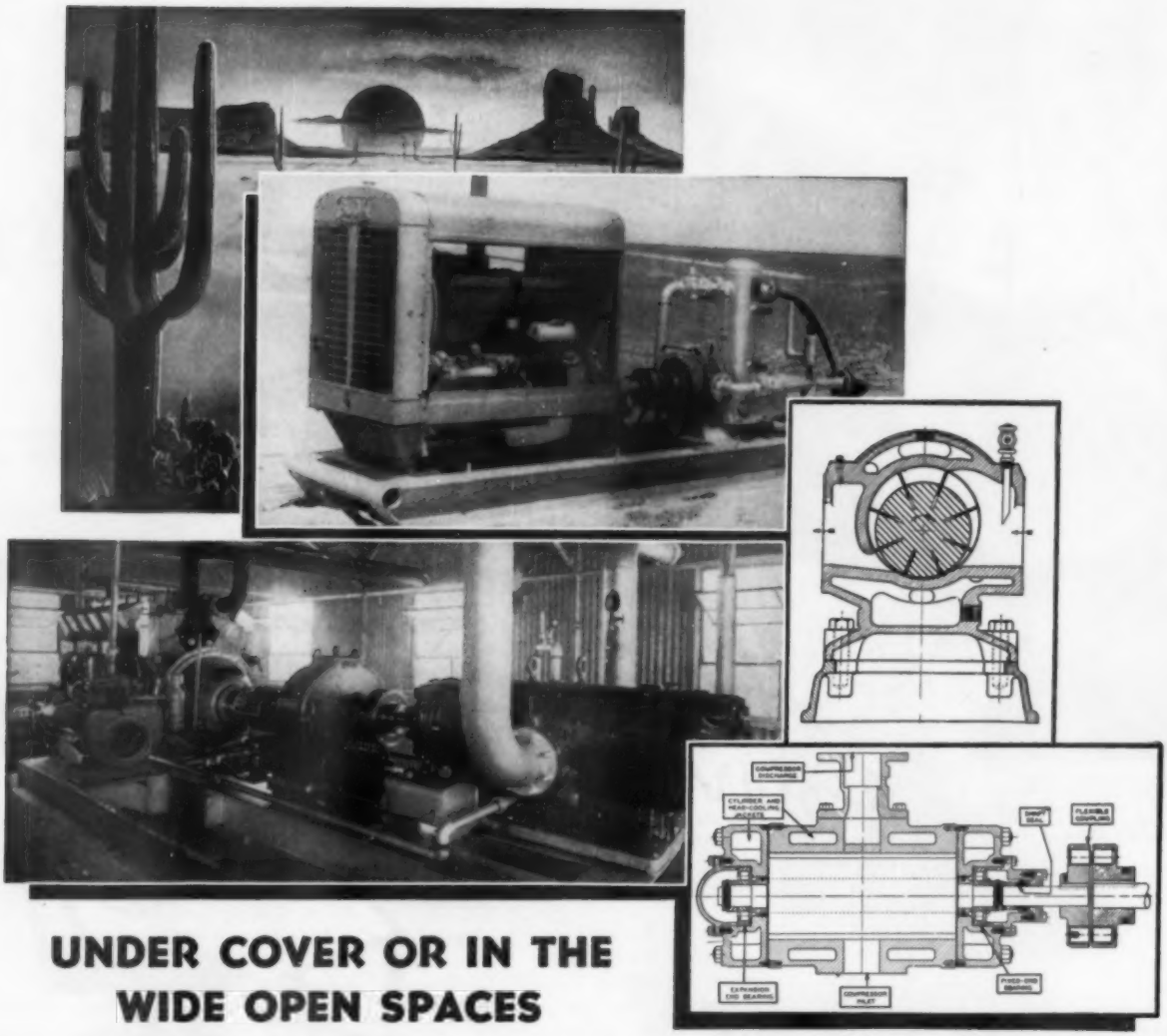
Available through all qualified supply stores.



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. . . Fuller Rotary Compressors do a very big job

It's a job that, more and more, is being multiplied throughout the entire petroleum industry. For trouble-free gas gathering and boosting, as well as refinery gas recirculation, the Fuller Rotary Compressor has gained a wide acceptance.

Compactness, ease of installation, economy and versatility feature the Fuller Rotary packaged unit. In operation, the complete elimination of compressor valves, crankshafts, pistons and numerous other moving parts considerably brightens the problems of maintenance, and replacement. Metering problems and pressure fluctuations are reduced to zero because of pulsation-free flow due to rotary compression. Blades are held out by centrifugal force, compensating for wear, thus maintaining capacity for the life of the machine. Fuller's rotary principle is completely free of reciprocating parts, thus avoiding the basic cause of vibrations.

There are other eminently practical qualities, too, all of which are fully described in our literature, along with sizes and installation examples. We'd like you to have a copy. All you need do is ask for it.

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PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

Gas-lift valve fits tight spots

. . . where large-diameter, standard-size valves can't be used. One model is the K Series for KB, KC, and KT side-pocket mandrels. The other is used with standard models.

Bellows assemblies are interchangeable between the two. The junior size is a 1-in. valve with a 0.750-in. o.d. bellows having an effective area of 0.300 sq. in. Both valves are available with a magnetic ball-check valve. **Write or call: Harold Brown Co., 2417 Bissonnet, Houston, for details on junior gas-lift valves.**

Ammonia-refrigeration unit

. . . for gasoline plants and gas lines is skid-mounted and gas-engine driven. Called the Russcold mechanical-refrigeration unit, its available sizes range from 25 to 100 tons at 0° F.

The maker claims the unit can eliminate liquids in gas-transmission lines. It can be used to chill absorption oil for increasing hydrocarbon recovery in gasoline plants and as a refrigeration package for other services.

Using a completely closed system, it adjusts to load changes automatically. And it is simple to operate. **Write or call: Russell Engineering Corp., 2609 Sunset, Houston 5, for details on ammonia refrigeration unit.**

Cone-roof-tank relief valve

. . . is pilot-operated. The maker claims the valve can minimize tank breathing, thus increasing product savings. Tests indicate the valve can pay out in 7 to 8 months.

The tank-breathing system consists of a valve mounted on a tank and connected through a 3-in. aluminum tube to a pilot, also mounted on the tank. The valve comes in 6, 8, 10, and 12-in. sizes with low-pressure (½ to 8 oz.) or high-pressure (½ to 15 lb.) pilots. Valve housing may be an open or closed type. **Write or call: Johnston & Jennings Co., 6917 Bessemer Avenue, Cleveland 27, for Bulletin 581.**

Caulking compound stays flexible

. . . on joints which expand or contract. A series of three synthetic polysulfide-rubber caulking compounds formulated from several types of elastomeric-base resins are available. Unlike conventional caulking materials that embrittle and lose bond in expansion or weathering, the caulking materials have 400 to 500% elongation, the maker claims. This is more than adequate for severe expansion and contraction problems.

The compounds do not crack or pull loose from the joints. Weathering, water resistance, and flexibility properties are said to be excellent. And their chemical resistance is reportedly good to excellent in solvents, good in alkalis, and fair to good in acids.

The Carboline caulking compounds can be used on aluminum, concrete, brick, glass, cinder block, steel, and wood, and where any of these materials are joined to themselves or each other. Their uses include caulking of concrete or metal expansion joints, and concrete cracks in walls to protect against fresh or salt-water and oil seepage. They can also be used for sealing some types of leaking tanks where seams or joints expand or contract. **Write or call: Carboline Co., 32 Hanley Industrial Court, Brentwood 17, Mo., for details on Carboline synthetic-rubber caulking compounds.**

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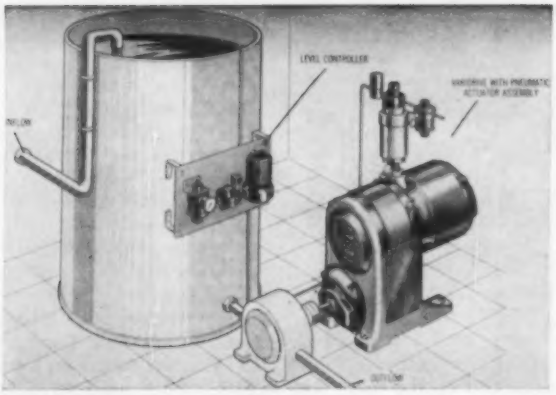

Open-tank level control

. . . keeps liquid levels constant. The system consists of a Varidrive motor equipped with a pneumatic Varitrol actuator. The Varidrive receives a signal from a level controller. It then automatically provides variable speed to the pump to maintain a constant level within the tank.

The new system is entirely pneumatic. It contains no floats or flow-restricting valves, the maker says. Free and steady circulation is maintained for proper control of the process.

Liquid level may be controlled in an open tank two ways—air purge and liquid purge. The air-purge method uses a bubbler tube. It is for use with water and other uniform liquids of low viscosity. The liquid-purge method uses a trickle flow of purge liquid. It is used with high-viscosity liquids that cannot be handled by the air-purge system. **Write or call: U.S. Electrical Motors, Inc., Box 2058, Terminal Annex, Los Angeles 54, Calif., for Controlled Speed Systems Bulletin F-1952 and Varitrol Bulletin F-1882.**

●

Larger-size line pipe and tubing

. . . available made of thermosetting-reinforced epoxy resins. The Fibercast line pipe and well tubing are now being produced in a 4½-in. o.d. size.

The pipe is noncorrosive and takes high operating pressures and temperatures. Other available sizes are 2⅜, 2⅞, and 3½ in. **Write or call: Fibercast Corp., Box 727, Sand Springs, Okla., for details on Fibercast line pipe.**

Supervisory-control system

. . . gives remote on-off control for such equipment as motors, pumps, actuators, valves, and switchgear. Consisting of a coder and a decoder, the MARC I & II system uses either telephone lines, radio, or microwave channels to transmit information. It presents the control data at the central station for automatic, visual, and aural monitoring.

It is an all-electronic device, using transistors and diodes for reliability. Employing compact construction, it has no moving parts. Each unit is a plug-in model constructed on a steel framework and held in position by large through-bolts and housed in a sealed steel case. Substitutions can be made by nontechnical personnel.

The system transmits and receives individual code trains simultaneously. These represent command and performance of a given function. The system also automatically monitors alarm conditions. Warning codes can be sent whenever any of several predetermined faults occur, such as overload, low temperature, or an open circuit breaker. **Write or call: Moore Associates, Inc., 2600 Spring Street, Redwood City, Calif., for details on MARC remote-control equipment.**

●

Fishing tool uses hydraulic jet action

. . . to retrieve junk. The tool has been tested successfully on nine fishing operations in West Texas and New Mexico, according to the maker. The Nedow tool picks up solid-cone bits, bearings, and other heavy objects without junk shots, the maker claims. It is designed to clean a hole in a single trip, cutting expenses of fish jobs.

The tool is fitted to a drill collar and lowered into the hole while the fluid is being circulated. A rotating cutting mill grinds up junk. Its teeth then carry the junk to the mill's center. There fluid flow carries the junk up through a slotted hard-rubber cone into an internal basket. The fishing tool is anchored by a collapsible, rubber-sleeve packer. It expands against the side of the hole to form a seal. The packer retracts automatically and cannot stick in the hole, the maker says. **Write or call: Nedow Oil Tool Co., 931 San Jacinto Building, Houston, for details on hydraulic jet-fishing tool.**

Send this **Showcase Coupon**

to the **Manufacturer** of the item in which you are interested. See name, address, and equipment name and/or model, in bold-face type at end of description.

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DATE.....

for successful fracturing
of your well...

CHECK THE PROPERTIES OF HALLIBURTON'S

VIS-O-FRAC

Base Fluid	Crude oil or light refined oils
Gelling Agent	Soap formed in situ
Method of Field Mixing	Batch or continuous
Type of Finished Fluid	Non-Newtonian gel • not an emulsion
Method of Viscosity Reduction	Easily diluted to low viscosity by formation oil
Fluid Loss Properties—API Code 29	Will vary with base fluid but normally will be 10-45 cc. Can usually be lowered with low fluid loss additives to 5-15 cc.
Temperature Stability of Fluid	Slight decrease in viscosity with increase in temperature. Viscosity index much higher than the base oil.
Sand Transporting Characteristics	Good • falling rate very slow. Normally, 1-3 lbs. per gallon is used.
Types of Formations Best Suited	Oil and gas bearing formations.

To stimulate production in your reservoir, Halliburton's VIS-O-FRAC offers you these benefits:

LOW FRICTION LOSS • GOOD SAND TRANSPORTABILITY • ECONOMY

Use VIS-O-FRAC for your next fracturing treatment. Talk to your local Halliburton representative for more information.

HALLIBURTON OIL WELL CEMENTING COMPANY
DUNCAN, OKLAHOMA

THE PIONEER IN FRACTURING SERVICES

284 SERVICE CENTERS – JUST MINUTES AWAY FROM YOUR WELLS

SHOWCASE . . .

New Equipment

New control system for natural gas

. . . operations developed. The system uses d.c. pulses for metering, control, and indication. A single pair of leased telephone lines connects all locations.

From a central control panel in a gas-dispatcher's office, or other strategically placed panel, storage areas can be monitored, compressors operated, valves opened and shut, and an entire gas-distribution system operated.

At the heart of each system are circuit-scanner units for control and indication of all steps and operations. They are compact and designed for long, reliable operation.

Installation is simple. The one pair of telephone lines is all the wiring needed. The maker's engineers design and lay out the complete system, including the operating of consoles and control cabinets ready to set in place. **Write or call: Femco, Inc., Irwin, Pa., for details on natural-gas control systems.**

Prefabricated regulator station

. . . is compact and fully enclosed. The district regulator station can be installed by simple inlet and outlet connections to existing mains at any convenient location without the need to obtain a special permit or purchase land, the maker claims.

Numerous manufacturers' regulators, relief valves, and pressure gages with similar capacities and ratings can be used. One lock protects all controls. Though completely accessible for service, the station is enclosed from the weather and vandalism.

The station can be obtained fabricated to the desired capacity and pressure and with the desired type of components. It has a slim silhouette that gives it a clean appearance. **Write or call: Tuloma Specialties, 8502 East Forty-first Street, Tulsa, for details on district regulator station.**

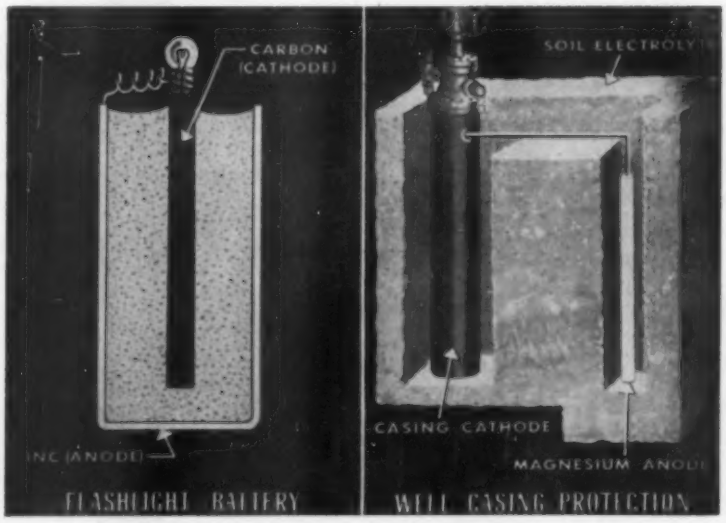
•

Nickel coating protects plug valve

. . . from corrosion in refineries and other processing plants. The nickel-coated valve has the same qualities of corrosion resistance as higher-cost solid-nickel or stainless-steel valves and with improved mechanical and physical properties, the maker claims.

The nickel coating is applied by the Kanigen process. With this process, uniform, dense, adherent, and nonporous nickel-phosphorous coatings are obtained by immersing the part to be coated in a tank of solution or by pumping the solution through the interior of large parts.

Materials that can be handled with the nickel-coated valves include sour crude oil, petroleum white oil, refinery brine solution, and sodium hydroxide. **Write or call: Rockwell Mfg. Co., 400 North Lexington Avenue, Pittsburgh 8, for details on nickel-coated valves.**



HOW NATURE'S BATTERY PROTECTS WELL CASING

In an ordinary flashlight battery current flows from the zinc case (anode) through an electrolyte to the carbon rod (cathode). The zinc anode is corroded away.

You can protect the casing in your oil and gas wells from external corrosion by completing nature's battery. Add a magnesium anode bed and let the well casing be the cathode. The soil between the two acts as the electrolyte.

CSI engineers—pioneers in the field—have protected hundreds of wells in this way: They first survey the wells, using special surface instruments designed by CSI. Polarization curves are plotted to determine the current required for cathodic protection. Then magnesium anodes are installed. Protection designed for 10 years has averaged about $350 per well.

CSI offers expert engineering and installation services—plus a complete line of Dow magnesium anodes and other brand-name cathodic protection supplies at competitive prices. Call or write today. Estimates or quotations without obligation.

CSI

CORROSION SERVICES INCORPORATED

TULSA, OKLAHOMA

P. O. Box 7343, Dept. J-15 **Telephone: Circle 5-1351**

SHOWCASE . . .

New Literature

Hydrogen-production processes

. . . types of plants, methods of purification, and industrial applications are described in new 36-page booklet entitled "Hydrogen," Eight processes in hydrogen production are detailed, and 10 purification processes are reviewed in the comprehensive booklet. Simplified graphs and charts further detail the information given. **Write or call: National Cylinder Gas Co., Girdler Construction Div., P. O. Box 174, Louisville 1, Ky., for Hydrogen booklet.**

Corrosion Control

. . . is the title of a new four-page pamphlet that describes the company's underground pipeline products. Described in the manual are properties, dimensions, and other specifications of glass-fiber Coromat underground pipe wrap for use on line-traveling equipment. A special mill and yard pipe wrap used for stationary equipment are also reviewed. **Write or call: Owens-Corning Fiberglas Corp., International Div., 16 East Fifty-sixth Street, New York 22, for Corrosion Control bulletin.**

ASTM colorimeters Bulletin FS-273

. . . describes new instrumentation that uses the ASTM color scale to determine color in a variety of petroleum products. The colors of petroleum products can be specified in terms of a set of fundamental standards, with clearly defined international chromaticity values. The eight-page booklet describes the ASTM colorimeter, Saybolt chromometer, and oil-tube heater. **Write or call: Fisher Scientific Co., 381 Fisher Building, Pittsburgh 19, Pa., for Bulletin FS-273.**

Desk-side analog computer

. . . a high-precision instrument that provides a portable computer center, is detailed in a new eight-page brochure. The Model MC-400 is a free-rolling castered cabinet. It features a 16-scale factor potentiometer, precision servo multiplier, true-overload alarm, monitor, and control panel, vacuum-tube voltometer, and complete programing patchboard. The brochure gives a detailed description of the equipment and applications.

WORKOVER TIME REDUCED . . .

KINZBACH PILOT SPEEDMILL DRILLS UP LINERS AT RAPID RATE WITH MINIMUM TOOL COST!

Cutting blades of sintered tungsten carbide aggregate are accurately centered in casing or liner by pilot nose for rapid, even cutting. Interchangeable blades can be quickly and easily fitted into a wide range of body sizes with tools commonly found on drilling rigs.

Positive signal of dulled blades by restricted circulation prevents loss of rig time in non-productive rotation.

Write for complete information and prices on Kinzbach Pilot Speedmill Liner Cutter and other milling tools.

KINZBACH TOOL CO. INC.

KINZBACH TOOL CO., INC.
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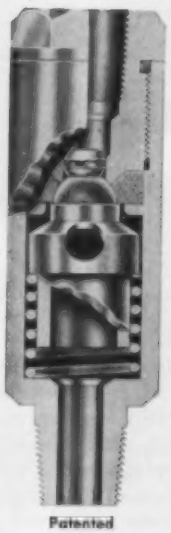


Patented

TRADE MARK TIME TESTED MACCO GAS LIFT REG. U.S. PAT. OFF.

MACCO NORMALLY CLOSED CHECK VALVE

The Macco normally closed, positive, triple seal check valve represents one of the major developments in the evolution of gas lift equipment. It is a 10,000 p.s.i. test, 5,000 p.s.i. working pressure valve which is manufactured with standard ½" pipe thread connections for installation wherever a fine heavy-duty, dependable check valve is required. Their patented design makes them particularly resistant to the ill effects of abrasive erosion and acid.

Installed on Macco gas lift valves this check valve positively prevents back flow of fluid from the tubing to the casing. They also make it possible to acidize the formation or back-pressure the tubing without exposing the casing to either acid or extreme pressures. A scientifically designed hollow "float" allows all of the gas or fluid which passes through the check valve to pass through the lateral openings and hollow stem. This feature provides protection for the spring. Macco check valves are triple seating—first, a metal shoulder on a "resinoid" disc, metal-to-metal under high pressure, and "O"ring seal.

Write for additional literature or information.

MACCO OIL TOOL COMPANY, INC.

1521 Prince P. O. Box 7288 Houston 8, Texas
Phone UN 1-1253

Why Blowouts Are Getting Few And Far Between

Pipe bent like spaghetti . . . rigs reduced to scrap . . . and a fortune up in smoke is still clear in the minds of many oil operators.

In the middle 1930's, spectacular blowouts and costly fires were almost commonplace. Practically every new field, where deeper exploration was in progress, was pock-marked with a crater or two, grim reminders for the rigs that followed of the hazards that lay ahead for them.

The recognized discovery of "drilling mud" came with Spindletop where cows were driven through the earthen tanks to mix mud. Surface controls, such as blowout preventers, gained prominence after the famous "Wild Mary" Sudik in Oklahoma City.

Steady improvements in controlled drilling fluids and surface control equipment signalled the start of a new era in deeper drilling and completion practices. Throughout all the development stages of better well control, oil operators and PESA Members have worked as a team.

Still, there is much to be done.

And much of it will be accomplished in the future, as in the past, through the research facilities, time, money and personnel of members of the Petroleum Equipment Suppliers' Association.

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

*

PETROLEUM EQUIPMENT SUPPLIERS ASSOCIATION

PROUD TO BE PART OF A PIONEERING INDUSTRY

87—103

Write or call: Mid-Century Instrumatic Corp., 611 Broadway, New York 12, for desk-side analog computer bulletin.

Airsonic industrial stethoscope

. . . is described in new eight-page bulletin. As it is nonelectric and has no diaphragm, it has no fixed frequency of its own and is reportedly capable of picking up sounds of all frequencies and reproducing them at desired volume. Made in Belgium, it has interchangeable probes and horns. It is applicable to pumps, gasoline and diesel engines, compressors, generators, turbines, steam boilers, electric motors, and precision instruments. **Write or call: M. Paquet & Co., Inc., 17 Battery Place, New York 4, for Airsonic industrial stethoscope bulletin**

Insulation for indoor

. . . or outdoor applications for such equipment as furnaces, boilers, evaporators, heat exchangers, kilns, turbines, piping, and process vessels is described in new eight-page Catalog 12C. Detailed descriptions are included of Thermalite 85% magnesia insulation and Thermasil calcium silicate insulation. Physical properties, applications, forms, thicknesses, and thermal conductivity data are listed. Other insulations are also described. **Write or call: Ehret Mfg. Co., Valley Forge, Pa., for Catalog 12C.**

New scrubber

. . . removes 99.5% or more of all solid or liquid entrainment in gas or vapor, according to the maker. It's described in new four-page Bulletin 500. Cutaway views of both types of WD scrubbers—one equipped with a spray ring, the other with an internal liquid feed—show how contaminated gas or vapor is first scrubbed and then dried as it passes through this vessel with minimum pressure drop. Five design variations are shown. **Write or call: Centrifix Corp., 3608 Payne Avenue, Cleveland 14, for Bulletin 500.**

Silicone rubber-insulated cables

. . . are described in a new 16-page booklet. It's designed to help you prepare specifications for special electric-cable installations. Special properties of Nepco-Sil are described as particularly suited to extreme temperature applications (to 200° C.) and to conduit installations where load facilities make it impractical to increase copper sizes. Specifying factors are included. **Write or call: National Electric Products Corp., 2 Gateway Center, Pittsburgh 22, for Nepco-Sil silicone rubber-insulated cables bulletin.**

Planetary gear operators

. . . for use with Rockwell-Nordstrom Hypreseal wrench-operated valves handling high pressures—are described in new four-page, illustrated Bulletin V-610. Easily installed by one man, the operator is lightweight and compact. With a 5-to-1 gear ratio and a 4-to-1 mechanical advantage, one turn of a wrench will close or open the valve, the maker says. The bulletin also includes an operator-selection guide and installation directions. **Write or call: Rockwell Mfg. Co., Meter & Valve Div., 400 North Lexington Avenue, Pittsburgh 8, for Bulletin V-610.**

Automatic shutoff valves

. . . for overload protection of gages and instruments in hydraulic and pneumatic systems are described in new two-page Bulletin 3700. Six models offer pressure ranges from 10 to 10,000 psi. The bulletin lists specifications, features, installation, and adjustment details. **Write or call; Sprague Engineering Corp., 19300 South Vermont Avenue, Gardena, Calif., for Bulletin 3700.**

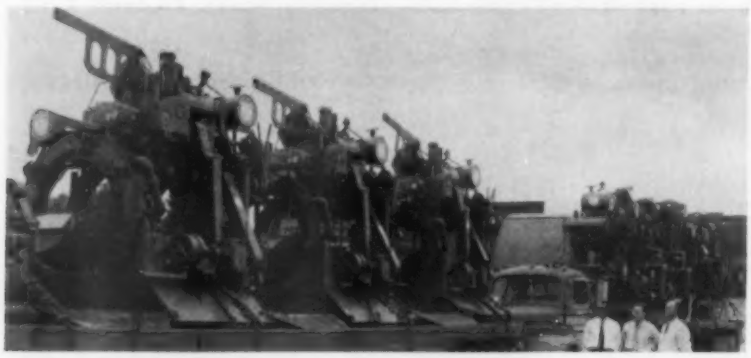
Grease lasts 52% longer because- they run cooler!

NEW R&M "All Weather 40" OIL COUNTRY MOTORS

R&M "All Weather-40" Motors have a heat rise of only 40°C. with rodent screens installed, compared to 55° for other makes. A leading bearing manufacturer proved grease lasts 52% longer when rise drops from 55° to 40°C. This means less maintenance, longer bearing life, longer service intervals with R&M motors. Write for Bulletin 520-OG.

ROBBINS & MYERS, INC.
MOTOR DIVISION • SPRINGFIELD, OHIO

EQUIPMENT MEN



Crose ships pipeline construction equipment

. . . from its plant in Tulsa. This equipment is part of a three-quarter of a million dollar order slated for Argentina. Involved purchasers include International Pipe Line Constructors, S.A., and River Construction Co., Fort Worth, Tex. Equipment will be used on construction of a 1,200-mile pipeline running from northern Argentina oil fields to Buenos Aires. M. J. Crose Manufacturing Co. men looking on are: Buck Royal, sales representative; John Manley, export sales manager; and John Behrenfeld, vice president and sales manager, all with Crose.

BS&B moves sales headquarters

Lee Kelton

H. O. Ebeling

Ed Moses

. . . for the West Texas-Rocky Mountain area from Oklahoma City to Dallas, according to Floyd C. Myers, vice president and manager of oil field sales, Black, Sivalls & Bryson, Inc.

Lee Kelton, area sales manager, relocates at Dallas, Tex., to supervise operations of the Dallas, Shreveport, La.; Midland, Tex.; Farmington, N. M.; Casper, Wyo.; and Denver, Colo., districts. North Texas district offices have been moved from Fort Worth, Tex., to Dallas with H. O. Ebeling as manager of the Dallas oil field district. Ed Moses, central office staff specialist on lease automation, also goes to Dallas to lend technical assistance to field personnel in the West Texas-Rocky Mountain area.

Western Co. installs station

. . . with fracturing and acidizing facilities at Liberal, Kans., reports C. E. Wooldridge, Oklahoma City division manager. The new station is a relocation of Western's Ulysses, Kans., installation. The station move involves transfer of 27 sales and operations personnel. Dick Brammer continues as district sales manager; and Abe Butler as district operations manager.

Continental-Emsco Co. names

. . . D. W. Mayes, store manager at Borger, Tex.; E. O. Ross, store manager at McAllen, Tex.; J. E. Dennis, store manager at Magnolia, Ark.; and F. E. Smith, store manager at Shreveport, La.

McCullough Tool Co. reports

. . . personnel changes in the Rocky Mountain division operations, according to I. J. McCullough, president. Eldon Winn, service unit operator at Vernal, Utah, has been appointed branch manager in charge of operations in the Rock Springs-Big Piney, Wyo., area. David G. Boe, sales representative, transferred to Cortez, Colo., from Kimball, Neb.

Lucey Products Corp. announces

R. P. Clark

. . . the resignation of R. P. (Salty) Clark as vice president and director, according to F. E. Bernsen, chairman. Clark has formed his own company, Oil Country Supply Co. with offices in the Mid-Continent Building, Tulsa. He joined Lucey in 1939. He has formerly served with International Supply Co. and Worthington Pump & Machinery Corp. He also represented The Oil and Gas Journal as advertising manager on the Pacific Coast.

Oilwell announces appointments

R. E. Gant becomes assistant district engineer at Great Bend, Kans., reports Mark Barkhurst, Mid-Continent area manager, Oil Well Supply Division, United States Steel Corp. T. J. Slattery is named assistant district engineer at Casper, Wyo., according to R. L. Armstrong, Rocky Mountain area manager. Gant and Slattery both joined Oilwell in 1957.

Globe Oil Tools Co. expands

D. E. Jacobson

Hugh McVey

. . . its engineering facilities, according to John V. Pennington, vice president and general manager. The recent appointment of Hugh McVey and D. E. Jacobson to the engineering department was also announced. Both men have mechanical engineering experience with oil well equipment manufacturers. Globe is located in Los Nietos, Calif.

Magcobar promotes D. G. Willis

D. G. Willis

. . . from publications manager to advertising manager, reports W. M. Johnson, president of Magnet Cove Barium Corp. In his new position, Willis will also retain his former responsibilities. He succeeds B. A. Weil. He has varied experience in the writing, editing, and advertising fields.

Cooper-Bessemer Corp. honors

. . . H. A. Gehres, retired vice president, for his outstanding contributions to the oil and gas industry over the past 48 years at the annual conference, Oil and Gas Power Division of the American Society of Mechanical Engineers, in Philadelphia, Pa. At the same meeting J. D. Hines, chief research engineer, and Nelson

Reed, designer of rotating machinery for Cooper-Bessemer, received honorary commendation for their work in the oil and gas power industry.

CEC approves executive changes

. . . by creating two new vice presidencies and reassignments of executive responsibilities. Philip S. Fogg continues as board chairman and chief executive officer of Consolidated Electrodynamics Corp. but reassumes the presidency. Hugh F. Colvin has been made senior vice president in charge of Pasadena divisions. The newly appointed vice presidents are Kennett W. Patrick, director of the transducer division, and Frank M. Jenner, general manager, Rochester division.

Frank W. Weldon appointed

. . . district sales manager for Kelite Corp., according to William Sorensen, marketing director. Weldon will be responsible for Kelite sales in the Dallas, Tex., district. Prior to his appointment, he served for 12 years with Oakite Products, Inc.

F. W. Weldon

John Tullis elected

. . . executive vice president of Stratoflex, Inc., according to Ken W. Davis, president. Formerly executive vice president of Unit Rig & Equipment Co. in Tulsa. Tullis has also been acting as vice president, manufacturing, of Stratoflex.

John Tullis

Natural gas compressor plant

. . . is due to begin operation this fall, according to Don Wolcott, vice president and general manager of Steelman Gas, Ltd., Steelman, Sask. It is the first privately owned and operated natural gas compressor plant in Saskatchewan. Seven Worthington Corp. turbocharged SLHC gas engine compressors will be used to gather gas from the field batteries and provide air in the process plant.

Badger-Comprimo N.V. awarded

. . . contracts with a total value of $2,800,000 for three chemical plants and an asphalt production unit. Names of clients and types of products for the chemical plants were not revealed. The asphalt production unit is for Esso Belgium. Work on all four projects is already under way. Badger-Comprimo N.V. is jointly owned by Badger Manufacturing Co. and Comprimo N.V., The Hague.

Oakite Products, Inc., assigns

. . . J. J. Basch to the new position of marketing vice president. He was formerly vice president for research and product development. He will now be responsible for sales, engineering, advertising, and marketing research as well.

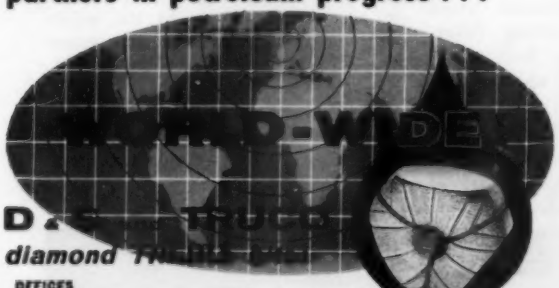
Tuloma Builders, Inc., opens

. . . a pipe fabricating shop at St. Catharines, Ont., in association with Canadian Comstock Co., Ltd., to better serve the petroleum industry of Canada.

R. B. Pratt appointed

. . . as vice president of Petty Geophysical Co. He is in his 25th year with the company. He is a member of Society of Exploration Geophysicists and an associate member of American Society of Civil Engineers.

partners in petroleum progress . . .



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FOREIGN—DRILLING & SERVICE LTD:

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SOUTH AMERICA

ARGENTINA—Buenos Aires, c/o Kenneth J. Langley, Corrientes 1115, Cable: "Langco." VENEZUELA—Caracas, c/o Petroleum Industry Consultants, C.A., Apartado 3992, Cable: "Peticon." BRAZIL—Rio de Janeiro, c/o H. V. Lage, Rua Mexico 45-11 Andar, Cable: "Siminal." NEW YORK, U. S. A.—New York 36, c/o D. T. O'Connor, 500 Fifth Avenue.

Drilling & Service

"How long will he be tied up—ha!—Some reporter asked him the silly question of what he attributed his success to."

THE OIL AND GAS JOURNAL

Contrite editor corrects error in June 23rd issue

. . . involving the transposition of two illustrations, or two cut lines. With apologies to Geophysical Associates International and to Smithco Engineering, Inc., the red-faced editor endeavors to make ammends. The illustrations are shown below with their appropriate cut lines.

Geophysical Associates International occupies

. . . this 9,000 sq. ft. headquarters building in Houston. The building is divided into sections for administrative, stenographic, drafting, mapping, magnetic equipment research and assembly, supply, and storage. Principals are Dr. L. L. Nettleton, E. Joe Shimek, and Dr. N. C. Steenland. Operating divisions are: Gravity Meter Exploration Co.; Geophysical Associates; Muskeg Equipment Rentals, Ltd.; GMX Corp.; C. A. Asociados Geofisicos Internacional de Venezuela; C. A. Exploradora Gravimetrica; Asociados Geofisicos Internacional S.A.; Geophysical Associates International, Inc.; and Liberty Exploration Co.

Smithco Engineering, Inc., announces completion

. . . of this new manufacturing facility in Tulsa, according to Orville Smith, president. The building contains over 10,000 sq. ft. of floor space. The 11-acre property is adjacent to rail lines and has complete facilities for shipping and receiving materials.

Johns-Manville opens plant

. . . in Denison, Tex., to make asbestos-cement pipe. It will be the first continuous process plant for producing this pipe, operating in the United States. The Johns-Manville Pipe Division, which functions virtually as a separate company, will operate the Denison plant. The continuous-process pipe machine has a double press arrangement which allows formation of pipe at two alternating stations to which pipe mandrels are magazine fed automatically.

Warehousing established

. . . jointly by Raybestos-Manhattan, Inc., Passaic, N. J., and Import Tool Co., Ltd., Edmonton, Alta., to service the western Canadian oil fields through established supply houses. Ample stocks will be maintained at Edmonton and Calgary, Alta.; Fort St. John, B. C.; and Estevan, Sask., to provide fast delivery and service.

Great Lakes to expand

. . . its wire line units by 50% during the next 6 months. J. T. Hancock, Jr., president of Great Lakes Petroleum Services, Inc., made the announcement along with Manly B. Brown, vice president of marketing for the parent company, Great Lakes Carbon Corp. The Houston based company is presently serving Texas, Oklahoma, Louisiana, and New Mexico.

Tulsa firms form foreign unit

Precision Exploration Consultants, Ltd., and Consolidated Geophysical Surveys have joined their facilities in Precon, a geophysical service. While the independence and identity of each firm is preserved in the organization, the talents of both firms are now available in a single package for complete foreign exploratory programs.

Patterson Supply Co. licensed

. . . by Polyken Sales Division of The Kendall Co. to carry its polyethylene protective tape coatings line. The addition of this Denver firm will provide increased service to the Southwest and Rocky Mountain areas.

Tore Wistedt appointed

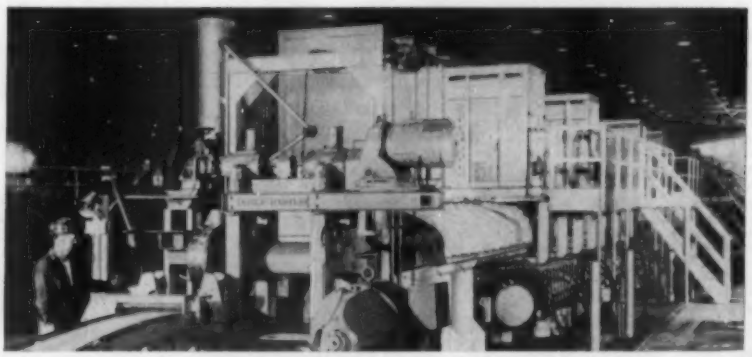
. . . general manager of Foster International Corp., an affiliate of L. B. Foster Co., according to C. G. Hugus, Jr., vice president. Before joining Foster this year, Wistedt was president of American Ferrox Corp.; and prior to that served as president of Edstrand Brothers, Inc.

Fred C. Catron joins staff

. . . of Master Tank & Welding Co. Dallas, Tex., as sales engineer. For the past 8 years, he has been in all phases of steel fabrication for the chemical and petroleum industry, from drafting to shop foreman to sales. In his new position, he will be working with pressure vessels and large diameter pipe.

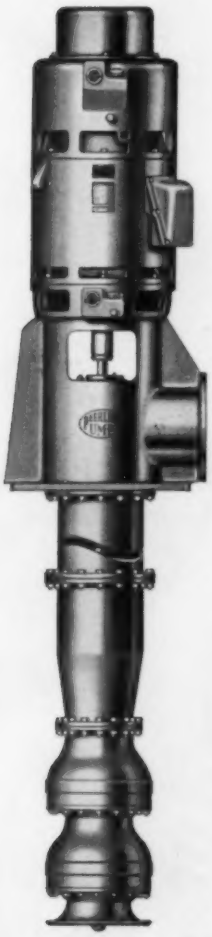
Bigelow-Liptak Corp. opens

. . . a new Mid-Continent sales office in Tulsa. E. B. Wolf, vice president in charge of sales, said the office will serve the petroleum and petrochemical industries headed by John A. Knebel. The territory covered includes all of Missouri, Kansas, Oklahoma, and Texas Panhandle as well as both St. Clair and Madison counties in Illinois.



Coiled skelp is passed through this furnace

. . . from the 44-in. hot strip mill, heated, and then formed into pipe in J&L's new continuous weld pipe mills. This 190-ft., 9-in. furnace is part of the second of two modern continuous weld pipe mills put into operation by Jones & Laughlin Steel Corp. to complete the program at Aliquippa, Pa. Facilities added at the plant include two basic oxygen furnaces, a 44-in. hot strip mill, an electricweld line pipe mill, expanded soaking pit facilities, and additions and improvements in many other departments.



mark of distinction

As the Northwest Indians told their story with totem poles, Peerless Pump dramatizes theirs in terms of outstanding performance. An example is the Peerless vertical industrial service pump. Versatile and economical, these pumps offer excellent head-capacity characteristics, plus other measurable advantages such as: *advanced vertical turbine design* for peak efficiency, *designed-in flexibility* for adaptation to future system requirements, *vertical pump-motor design* for maximum utilization of floor space. Available in water and process liquid handling types, the Peerless vertical industrial service pump can be applied to all installations where liquids are to be transferred from short settings.

WRITE FOR BULLETIN NO. B-505

PEERLESS PUMP

Putting Ideas to Work

fmc FOOD MACHINERY AND CHEMICAL CORPORATION

FOOD MACHINERY AND CHEMICAL CORPORATION

Peerless Pump Division

Plants: LOS ANGELES 31, CALIFORNIA and INDIANAPOLIS 8, INDIANA

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GRANT DIRECTIONAL
HOLE ENLARGER

THE ENGINEERING ANGLE ON DIRECTIONAL DRILLING

Operators tell us the Grant Directional Hole Enlarger is the finest engineered tool of its type. It is extremely rugged . . . has replaceable cutter assemblies . . . and is the only hole enlarger manufactured with both sleeve and roller bearings to meet all requirements.

Knowing the oil fields—and what operators need in down-hole tools—is part of the job for Grant engineers. With this knowledge, backed by 30 years of manufacturing skill and specialization, Grant leads the field with the tools you need to drill wells *better,* for less.

Write for Bulletin 38

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Twin strikes lift California hopes

BY FRANK J. GARDNER

FOR SEVERAL YEARS now, California's been thirsting for a really good new oil strike. But the thirst has gone unslaked. Now, however, the southern San Joaquin Basin has come up with a new discovery — two of them, in fact—that could mean not only an important new field, but may point the way for similar future strikes.

Both discoveries are by Richfield Oil Corp. Both are in Kern County and they're only 12 miles apart. The KCL "H" 34-9 wildcat, in Section 9-11n-21w, has found the first production on the San Emidio nose; after proving itself capable of flowing 2,520 bbl. daily, it's been finished for a 265-bbl. potential on a 14/64-in. choke. At the same time, the KCL "G" 83-24, a confirmation to the Highway area discovery in North Tejon field, was completed for 334 bbl. per day on 10/64-in. choke after flowing at 3,058 bbl. daily.

SIMULTANEOUS STRIKES at San Emidio nose and at North Tejon's Highway pool emphasize the new oil that awaits discovery throughout California.

A sedimentation riddle . . . These two rich wells are the climax to a long-disappointing campaign in this area (OGJ, July 14, p. 66). Since 1935, the San Emidio nose, on the flank of the long east-west San Emidio anticline, had snubbed the wildcatter; six deep dry holes, one of them reentered and deepened twice in a search for upper Miocene sands, were drilled on it. Ohio Oil Co., The Texas Co., Continental Oil Co., Shell Oil Co., Western Gulf Oil Co., and Richfield all had tried. But every time, the target sands had proved too tight to flow. Richfield has hit at its third try.

Now the operator has staked a San Emidio northwest offset at the KCL "H" 81-8, in Section 8-11n-21w, in an attempt to feel out the pay trend a bit. Dry holes have been drilled up and downstructure from the discovery, and obviously the problem is to be a stratigraphic one. Richfield is encouraged to some extent, however, by the relatively flat-lying Miocene beds here. To define the limits of the jackpot sand, more drilling is the only tool. The pay lies at 11,452-11,560 ft. in the Reef Ridge section of the Miocene.

And a new fault block . . . In the Highway area, North Tejon field, Richfield's KCL "G" 83-24 found the Z-1 lower Miocene pay sand at 8,681-9,063 ft. This one lies within a newly discovered fault block at the north end of North Tejon, and the structural picture points to a possible major accumulation. Here we have a newly discovered pool on a previously known uplift, but separated from the nucleus of production by faulting.

These two discoveries are signposts to California's future course in exploration. For the past few years, the principal guide to new reserves has been ever-deeper drilling in the older producing fields. Some of this has been well charted, but much of it has been blind. It's true that much new oil is to be found, clear to basement, by probing deeper. But it's also true that a lot of drilling remains to be done in California in sparsely explored regions; here the search for structure must be resumed via the seismic crew. Of the 45,000 sq. miles of favorable sedimentary rocks in the state, just over 1% (or about 500 sq. miles) has proved productive. This dreary statistic in itself is evidence that we've given up too soon on California.

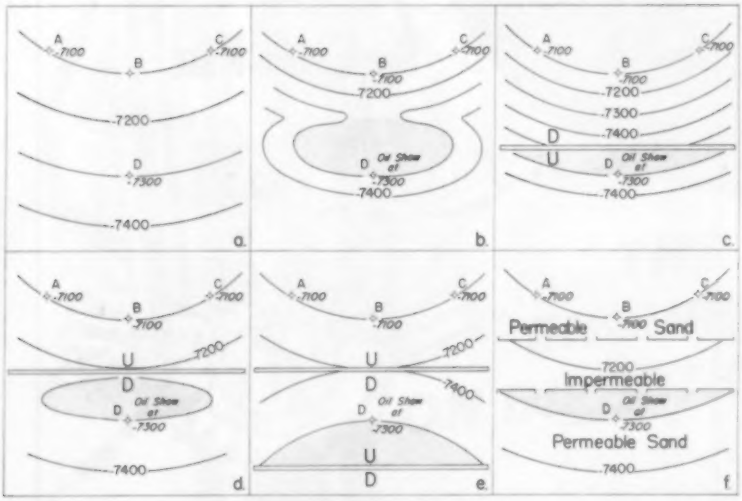
Provide an argument . . . But the truly important lesson for California explorationists is spelled out at San Emidio: six dry holes do not condemn a prospect—not until we know a lot more about sedimentation and stratigraphy than we know today. Such a discovery as this is a strong argument for the added emphasis and research now being applied to these subjects, in our schools, in our company offices, and in our laboratories.

PART 2
CONCLUSION

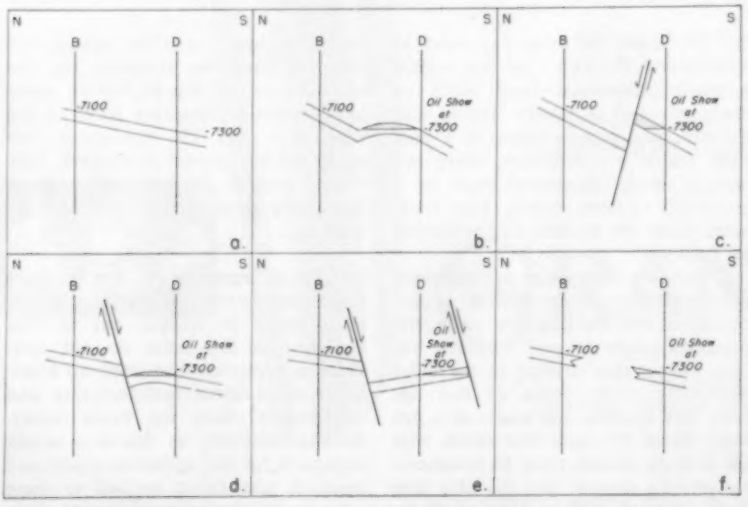
An inexpensive tool for oil finders is the

Subsurface structural map

BY LOUIE SEBRING, JR.
Geologist, Champlin Oil & Refining Co.,
Denver, Colo.



REMEMBER there are a number of possible solutions for any given set of subsurface data. Here are six based upon the known well information. Fig. 4.



A GOOD KNOWLEDGE of local and regional geology helps determine which is the correct solution when looking at a given area. Fig. 5.

IN EXPLORATION areas of minimum control, one of the best clues to interpretation is an oil or gas show in a nonproductive well. This is a direct indication of a trap and its importance cannot be overemphasized. The indicated trap may not be of commercial value, but the geologist should study his evidence carefully before discarding the reported show as of no importance. In areas of little control, the geologist will base his interpretation of the structure in the vicinity of the show on predetermined producing structures in the trend.

Geological conditions shown in plan view in the lettered diagrams of Fig. 4 are shown in cross-section view, similarly lettered, in Fig. 5. In Fig. 4a there are shown four unfaulted wells, "A," "B," "C," and "D." In the absence of any information on the normal rate of dip in the area, the geologist would contour it as a simple structural nose with its axis through wells B and D. A cross-section view of this same condition is shown in Fig. 5a.

Suppose, however, that there is reported a show of "live" oil in well D in the top of the sand which is being used as a mapping datum, and this sand is a well-developed permeable sand in all of the wells. Well D must now be separated in some manner from the other wells since it is structurally lower than they, and carries a show, which they do not.

Multiple interpretative possibilities now become apparent. The geologist will probably choose to keep the dip axis of this structure in about the same place since he now has two indications that it is where he has previously pictured it; that is, the structural contour passing through wells A, B, and C and the show in well D.

A simple interpretation that could be applicable in almost any area of low dip and reasonable competent beds is found in Figs. 4b and 5b. Here a high area is centered north of well D and separated from the other wells by a structural saddle. The

high could also be south of well D, but a saddle must separate it from the wells to the north.

In Figs. 4c and 5c, the upper wells are separated from well D by an up-to-the-south fault so placed that it would not cut any logged portion of the wells. Such an interpretation might be favored in any trend where this type of trap is common, like the Edwards, Pettus, or shallow Wilcox trends of Southwest Texas. In Figs. 4d and 5d, well D is separated from the upper wells by a down-to-the-south fault with an indicated high area north of well D.

If the log of well D did not go much below the datum, and if it were lengthening considerably over the other wells immediately above D, the geologist would show his high as south of the well and the down-to-the-south fault immediately north of the well. This interpretation would be a favorite almost anywhere in the Gulf Coast where it is probably the most common producing feature.

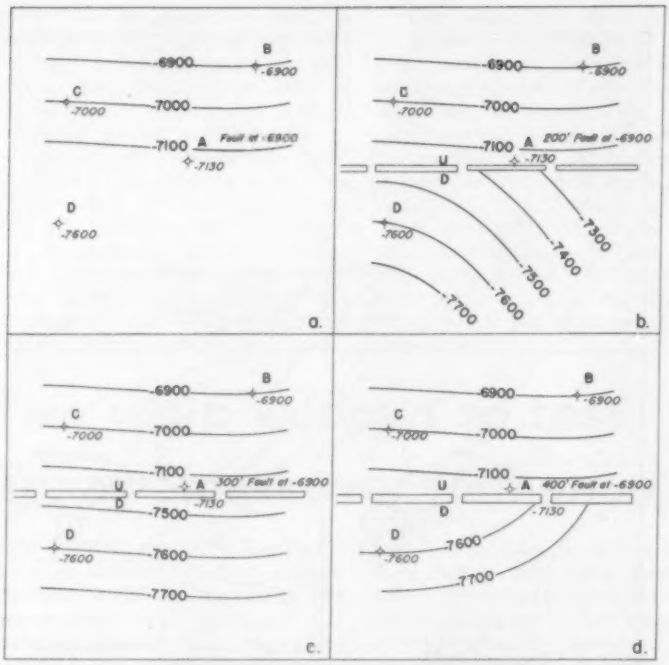
A somewhat more complicated interpretation would show down-to-the-south strike faults both north and south of the well D, with the well being on the north flank of the indicated structure. This is shown in Figs. 4e and 5e, and is a very common producing feature in the deep Wilcox trend of Southwest Texas and in some areas of the Frio and Miocene trends throughout the Gulf Coast.

Still another possible interpretation is shown in Figs. 4f and 5f. In these figures, the show in well D is caused by an updip permeability barrier which traverses the nose. Then since it was stated earlier that the mapping datum was a sand carrying a show only in well D, but well developed and permeable in all of the wells, it is necessary to draw a downdip permeability barrier south of the three upper wells.

This type of trap, caused by repeating bands of permeability approximately paralleling the structural strike, is occasionally found in the Yegua-Jackson and Frio trends of Southwest Texas. It is the most common type of trap in the Denver-Julesburg basin, but there the figure would be turned 90° to the right since the regional dip in the main producing area of the basin is to the west.

Oil shows . . . The absence of reported shows in the wildcat wells mapped is not so important as their presence. A prospective area should not be condemned because wells on the flanks of the area have not reported shows. These wells may have actually had shows that were not recorded.

In extremely permeable productive zones, like the Miocene of Louisiana,



UNLESS a well actually cuts a fault it is difficult to locate the exact position of the fault trace. If sufficient well control is available, the geologist should actually contour the fault plane. Fig. 6.

wells only a few hundred feet from production may penetrate the producing zone below the oil-water or gas-water contact and carry no show. This phenomena is explained by the sands' extreme permeability. In other areas, such as in parts of eastern Nueces County, some sands will carry oil shows at their top, regardless of their proximity to a producing structure. This may be due to small irregularities in the top of the sand that trap minute amounts of oil during migration.

Fault problems . . . In areas where faults are present and effective at the mapping level, additional control may be obtained by computing the datum elevation across the fault. Commonly, the only direct evidence of faulting found in subsurface mapping with electric logs, is an omission of section in a well cut by a normal fault and a repetition of section in a well cut by a reverse fault.

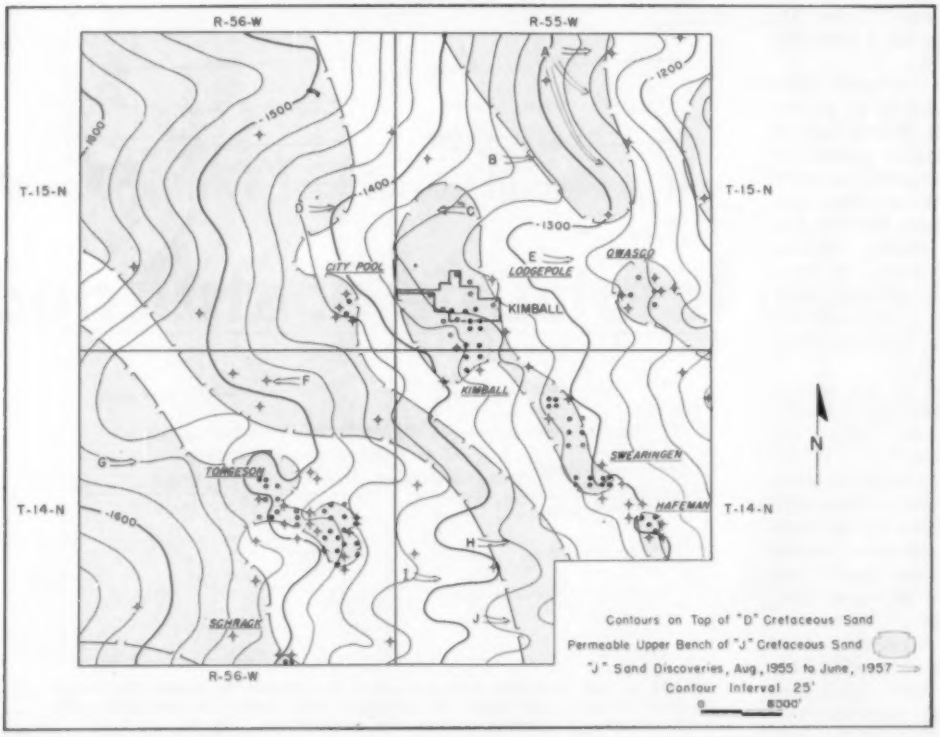
The amount of throw of a normal fault is taken to be equivalent to the thickness of the section missing, and the computation of the datum elevation across a fault is commonly done by adding or subtracting this throw algebraically to the datum elevation depending on whether the well is faulted above or below the datum point.

This value of the computed throw may be fairly unreliable if faulting was going on contemporaneously with deposition, if its value is not the same at all levels, or if the beds are dipping steeply into the fault plane. Since these are common occurrences, rigorous use of computed throws can result in structural interpretations that are misleading.

An example is shown in Fig. 6, where well A is faulted at —6,900 ft. Suppose that by comparison with the three other wells in the area, three different fault throw values of 200, 300, and 400 ft. are obtained. Using these values respectively one could have three interpretations showing on the downthrown side of the fault a high area east of well A, regional dip and a high west of well A. Multiple faulting, if the direction of their dips is unknown, is still another complicating factor.

The location of the fault on the map is dependent on its position in the faulted well and on the direction of strike the degree of dip of the fault plane. The dip and strike of faults is best determined by actually contouring on the fault plane.

Use all data . . . Since the geologist has now used most of the direct information available to him, he should now turn to any additional information, no matter how obscure, to help him in his interpretation of the areas of lesser control. This information may range from detailed seismic maps,



A COMBINATION map that shows both structure and stratigraphy is an excellent tool for development drilling and in locating future prospects. Fig. 7.

surface maps, core-drill maps and shallow subsurface maps to rumors of another company's seismic high. All of this should be carefully weighed before using or discarding it.

Generally the reflection seismograph is the geologist's most important source of additional information since it gives him a map attempting to show the subsurface structural conditions in the same manner as the geological map. Its limitations should be recognized. It is most accurate in determining direction of dip, somewhat less so in determining amount of dip and its accuracy of depth determination is dependent on many factors. Of course, faults and facies changes probably give the seismologist his greatest problems of interpretation.

The essential requisite of any geological map used in exploration is that it must indicate the anomalies that trap the hydrocarbons. In the case of petroleum accumulations trapped by a combination of structure and stratigraphy or by stratigraphy alone, the subsurface structural map will not by itself satisfy this essential requirement.

The requirement will generally be satisfied if the basic subsurface structural map is modified by the addition of boundary lines, commonly called pinchout lines, showing the updip extent of permeability in the various potential producing horizons.

Where the bands of permeability repeat themselves along a dip profile in strike bands, as in the Denver-Julesburg basin, or where production occurs in lenticular sands regardless of the structure, the actual final map will be simplified by showing all of the limits of permeability. The permeability of the individual zones is determined by core analysis, drill-stem tests, log analysis and core description.

In areas where there are numerous updip pinchouts of different potential producing zones at various levels, these may be superimposed on a basic structural map contoured at any depth, as long as the structural map reflects the structure adequately for all of the levels at which the pinchouts occur. The final map may become quite complicated if a great many of these pinchouts occur, and the geologist must carefully differentiate between the separate zone pinchouts.

Denver Basin

An example of the use of permeability boundaries in exploration is shown in Fig. 7. A four-township area in central Kimball County, Nebraska, centered around the town of Kimball is shown. The map was contoured on a 25-ft. interval at the top of the D Cretaceous sand and was completed August 11, 1955. There are no closed structural contours on the map. At the time of the mapping, the author believed that only the D sand, which acted as a single permeability unit, and the uppermost bench of the J sand were productive in the area studied. Since the uppermost bench of the J sand accounts for the bulk of the production in the area, and all of the discoveries since the completion of the map, only its permeability limits are shown on Fig. 7.

New fields . . . Discoveries made in the mapped area from the date of completion of this map through May 1957 were taken from the weekly issues of The Oil and Gas Journal. Their position is shown on the figure by arrows and letters A through J.

The multiple discoveries at A, now named Lukassen, Griffith, and Aue fields, were mapped as prospective. The discoveries at C, Morton field, D, Heideman field, and H, Marian field, were also mapped as prospective. At J, although the discovery well was outside the prospective area, this well is the furthest downdip producer in the field.

Subsequent development has extended updip across the prospect area and has joined the two discoveries at H, Marian field and J, Hein field, with the already productive Sloss field, located under the title block to the east. This producing area, now called Sloss-State, is by far the most important development in the area mapped, since there are now more than 50 new producing wells completed since the mapping was done and active development is continuing.

The discovery at G, Kleinholtz

field, could be described as a near miss, since the area immediately updip from the discovery was mapped as prospective. At I, Evertson field, the discovery might be termed an economic success and a geologic failure since the area was mapped as a D sand prospect and it actually produced from the J sand. Here the J sand possibilities were incorrectly evaluated, because all of the wells surrounding the prospect area showed the J sand to be tight by core and drill-stem test. The fact that all of these wells also had shows in the J sand should have been given more consideration.

At B, Strain field, and at E and F, which have not been named and may be considered extensions, the map did not show the areas as prospective. At B and E, the author should have been more optimistic in extending the well-defined northwest-southeast trending Kenton - Houtby - Owasco field trend, of which only the furthest northwest field, Owasco, occurs in the mapped area.

At F, the author was almost certainly a victim of incorrect well information. An offset to the discovery well showed the producing sand to be tight by core description and carrying no show. The sand appeared permeable on the electric log, and in fact was so interpreted. The failure to report a show condemned the area.

By June 1, 1957, only those new discoveries at A, Lukassen, Griffith, and Aue fields; at D, Heideman field; and at H and J, the previously mentioned Sloss-State area, appear to be commercially significant. All of the other new fields had a maximum of two producing wells.

This type of evaluation of a subsurface map has its limitations, since it gives an exaggerated picture of the quality of the mapping. A number of dry holes were also drilled in these areas that were mapped as prospective. However, if the map had been carefully maintained as the well logs on all of the new wells in the area were obtained, a more accurate delineation of the prospect areas would be possible.

Optimism necessary . . . Current maintenance of exploratory maps, made necessary by intense competition, will also enable the geologist to best evaluate his previous mapping efforts and those of his predecessors.

The exploration geologist's proper attitude is described as reasonable optimism. This leads to the conclusion that exploration for large reserves in the older producing districts should be concentrated in those districts where they are known to exist. In areas previously explored unsuccessfully, new basic approaches and techniques would seem more likely of success than a repetition of methods previously applied unsuccessfully.

The geologist must actively "sell" his maps and its prospects to his management, since all of his previous efforts are useless unless his work is used in acquiring land and drilling wells. To a very large degree, the exploration success of any geologist and his company is in direct ratio to the activity of the company.

The subsurface structural map, modified by the addition of permeability boundaries, when it is prepared and maintained by a competent geologist with a complete log file and adequate well records, will be an increasingly effective and relatively inexpensive tool for use in exploration.

Unless a direct method of finding oil is uncovered, the various subsurface methods based on well control will gradually tend to supplant all other methods as more and more wells are drilled in the never-ending search for petroleum.

Two deep wildcats to test Texas Smackover formation

NEW WORK reported in East Texas last week included two deep wildcats scheduled to test the Smackover formation.

Raymond Peace, Atlanta, has staked location for a 13,500-ft. wildcat approximately 1 mile south of Atlanta in eastern Cass County. The test will be 1 H. F. Carter, located on a 95-acre tract in A. S. Summerlin Survey, A-1017.

A Smackover failure was drilled in this area by Shell Oil Co. as 1 Gerald Smith, 5 miles to the northeast in R. Peters Survey, A-831. On elevation of 338 ft., 1 Smith logged the Buckner at 10,300 ft. and the Smackover at 10,682 ft.

Current Smackover exploration in eastern Cass County is Humble Oil & Refining Co.'s 1 Emma Walter, 2 miles north of Bloomburg. At last report total depth was 11,061 ft. Operators set pipe at 11,057 ft. and prepared to test shows in the Smackover.

Northeastern Hopkins County was also in line for further Smackover exploration. Dick Scott and Associates, Dallas, have made location 4 miles southwest of Sulphur Bluff townsite for 1 William Raines estate. Location is on a 538-acre tract in the James E. Hopkins Survey, A-398. (Some maps show this as James Hawkins Survey). Projected depth is 9,600 ft., with Trant Drilling Co. holding contract.

No. 1 Raines is on acreage farmed out from Sinclair Oil & Gas Co. Atlantic Refining Co. was said to be supporting the test. Drill site is 3½ miles southwest of Grelling Estate 1 Bassham, a gas-condensate discovery early this year, in the Smackover at 9,324-29 ft.

Salt dome test . . . Halbert Drilling Co. and E. C. Casey, Tyler, have made application to drill a Woodbine wildcat on the Whitehouse salt dome in southern Smith County. The new try is 2 Porter Skidmore, located 5 miles south of Tyler in the Drury Smith Survey, A-927. Projected depth is 5,600 ft.

Near-shore wildcat attracts attention in California

A WILDCAT for a reported new gas field discovery 2 miles west of Capitan field and 3,000-ft. from the shoreline in Santa Barbara County has been completed and shut in by Sunray-Mid-Continent Oil Co.

This well attracted particular interest because of its proximity to the five offshore parcels which recently drew record cash bonus bids.

The well, 1 Freeman, was still a "no-dope" hole but it is known that Sunray set 7-in. casing to 3,859 ft., ran a production test and then shut in the well.

Site of the reported discovery is about ¾ mile east of the most easterly onshore border of Parcel B. However, this was the least sought after of the five parcels when they went up for bidding late last month. It attracted only three bids, the highest and winning bid was made by Standard Oil Co. of California and Humble Oil & Refining Co. at $770,838.

It's interesting to note that the onshore areas opposite their offshore counterparts of the five parcels have seen little wildcatting. Three subcommercial gas wells were drilled by Western Gulf Oil Co., Standard Oil of California and Wilshire Oil Co. onshore from Parcel D in the 1930's and Standard of California drilled a dry hole on Government Point, 2 miles west of the west edge of Parcel E years ago.

It was Parcel D that attracted the highest bid of the five parcels. The Texas Co., Monterey Oil Co. and Newmont Oil Co. offered a $23,711,538 cash bonus for Parcel D. This parcel also has the deepest water depths of the five. About 40% of it is at depths of 100 ft. or less, but the last 60% falls off rapidly until one point on the extreme seaward border is more than 360 ft. deep.

Water depths on the others are: Parcel A, 30% 100 ft. or less and a deepest part of 220 ft.; Parcel B 20% 100 ft. or less and a 310-ft. deepest part; Parcel C 25% 100 ft. or less and a 260-ft. deepest part; Parcel E 40% 100 ft. or less and a 250-ft. deepest part.

California highlights . . . Richfield Oil Corp. completed its second offset to its Highway pool discovery in the North Tejon field of Kern County. Like its predecessors, the discovery well and an offset completed several weeks ago two locations south of the discovery, this latest offset appears to be an excellent well. Located two locations west of the discovery, it was brought in flowing 362 bbl. daily of 35.1°-gravity crude through an 11/64-in. choke from perforations between 9,045-9,305 ft.

NEXT WEEK

Geochemistry of the reservoir rock

EXPLORATION and development work have opened a new pool and extended a new area in the Midland basin area of West Texas.

Strawn and Devonian wildcats extend Texas production

WEST TEXAS exploration news last week included a completed Strawn pool opener, a prolific Devonian extension well, and another Strawn prospect testing.

The completion was Jake L. Hamon 1 Edna Page, in South Central Gaines County. Potential test from Strawn pay at 11,310 ft. was 328 bbl. of 46°-gravity oil a day through 18/64-in. choke. Gas-oil ratio was 1,606:1.

One Page was drilled to 13,889 ft. It found sulfur water in the Devonian at 12,840 ft., and plugged back to the Pennsylvanian for completion.

Location is NW NW Labor 11, League 303, Dawson CSL Survey, 10 miles southeast of Seminole. Nearby production is Wescott-Pennsylvanian field about 5 miles to the west, and Amrow-Devonian, the same distance south and slightly east.

The Breedlove, North (Devonian) field in northwestern Martin County gained its third producer at Husky Oil Co. 2 Breedlove. The well rated a daily flowing potential of 3,763 bbl., based on a 4-hour flow test which gaged 627.8 bbl. of 41°-gravity oil through ¾-in. choke. Devonian perforations were between 12,006-28 ft. Location is in Section 258, Brisco CSL Survey, 10 miles southwest of Patricia.

No. 2 Breedlove is Husky Oil Co.'s third successful well on a 1,500-acre tract in the field, in which Husky owns a 65% gross working interest. The company will drill a fourth test within 30 days, it was said.

In Central Martin County Jake L. Hamon and Republic Natural Gas Co. 1 Holton estate was trying for completion from the Devonian and Strawn pays. The well recovered oil from the Strawn at 10,808-30 ft., and flowed oil and gas while testing the Devonian at 11,953-85 ft. The Ellenburger tested salt water at 12,710-85 ft.

Location is in League 246, Wheeler CSL Survey, 21 miles northwest of Stanton.

Statement of Condition

At the Close of Business June 23, 1958

RESOURCES

Cash and Due from Banks	$89,018,314.58	
U. S. Government Securities	79,137,167.99	
Other Bonds and Warrants	16,845,499.55	$185,000,982.12
Loans and Discounts		86,721,334.61
Repurchase Agreements—U. S. Government Securities		16,077,668.40
Income Receivable Accrued		705,990.83
Stock in Federal Reserve Bank		382,500.00
Bank Premises		4,000,000.00
Customers' Liability Under Letters of Credit		216,089.92
TOTAL		$293,104,565.88

LIABILITIES

Deposits		$272,528,606.75
Letters of Credit Outstanding		216,089.92
Income Collected, Not Earned		361,082.77
Reserve for Taxes, Interest, etc.		1,264,621.55
Capital — Common	$ 5,250,000.00	
Surplus	7,500,000.00	
Undivided Profits and Reserves	5,984,164.89	18,734,164.89
TOTAL		$293,104,565.88

E. I. HANLON
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Vice Ch. of Board and Chief Executive Officer

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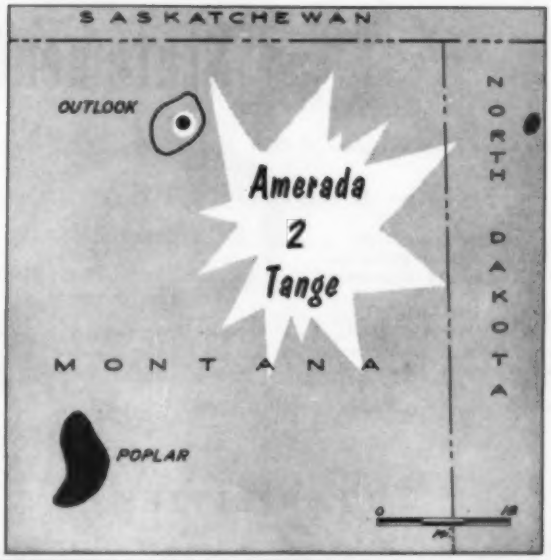
In Montana and Utah

Here's news about Outlook

THE FIRST discovery news in many months came out of Montana's famed pre-Madison field at Outlook, Sheridan County. This Williston basin field captured most of the exploratory and development news in the basin last year.

Amerada Petroleum Corp. added a new extension well last week to break the long drilling silence in this Silurian reservoir. The 2 Tange, E½ SW NE 20-36n-53e, flowed 100 bbl. of oil per hour on drill-stem test of the Outlook pay at 8,975-9,008 ft.

The 1 West lies to the northwest in NW NE NW 20-36n-53e, and the field discovery well (1 Tange) lies to the southeast in C NE SE 20-36n-53e.



THE FIRST good extension discovery in many months in northeastern Montana's Outlook-Silurian field is Amerada Petroleum Corp. 2 Tange.

. . . an Amsden find at Delphia

THE FIRST AMSDEN discovery news in Montana since last year is Amerada Petroleum Corp. and Texota Oil Co.'s indicated successful extension of Delphia field in Musselshell County.

The 1 Goffena, NW SE SW 25-9n-27e, flowed 20 bbl. of oil per hour from Amsden-Pennsylvanian pay on drill-stem test at 6,401-22 ft.

This extension discovery is 1 mile southeast of the discovery well which was completed early in 1957 for 428 bbl. of oil per day from Amsden at 6,280-6,300 ft. Amerada completed the northwest offset for 153 bbl. of oil daily on pump; the southwest offset made 20 bbl. per hour from 6,352-78 ft. on pump. Gage field lies west of Delphia field.

CENTRAL MONTANA'S Delphia field was extended last week at Amerada et al. 1 Goffena.

. . . and success in the Paradox

AN AREA of the Paradox basin that has not been too successful discovery-wise is the Bluff Bench unit in San Juan County. Carter Oil Co. apparently has confirmed its recent Bluff Bench discovery well at 8 Bluff Bench C NW SW 21-40s-22e.

Carter's indicated strike, about 1 mile southeast of the 4 Bluff Bench discovery well, flowed oil at the hourly rate of 15 bbl. after 28 minutes of a drill-stem test in the Paradox A-2 Pennsylvanian pay from perforations at 5,333-53 ft.

The discovery well at Bluff Bench, located in C NW NW 20-40s-22e, flowed 250 bbl. of oil and 77 bbl. of water daily from Paradox at 5,377-5,562 ft. and from open hole at 5,600-21 ft. Other confirmation wells have met with failure.

BLUFF BENCH FIELD on the west side of production in the Paradox basin finally got a confirmation prospect at Carter Oil Co. 8 Bluff Bench.

Are you tired of people saying "OIL PROFITS ARE TOO HIGH"?

Here is some information that may be of interest to you and a revelation to some of your friends!

COMPARE OIL'S RATE OF RETURN ON NET ASSETS IN 1957 TO THOSE OF OTHER LEADING INDUSTRIES.

AUTOS & TRUCKS — 16.4%

CEMENT — 15.9%

CHEMICAL — 14.0%

OIL PRODUCTION AND REFINING — 13.6%

IRON & STEEL — 13.2%

ALL MANUFACTURING — 12.8%

Oil Profits Are Not Too High!

That's your easy answer to those who claim that oil profits *are* too high! Let them examine, as you have just done, oil's rate of return on net assets in comparison with those of the other leading industries listed above.

Remember these facts when the uninformed start talking about oil profits.

For more information about your industry clip and mail this coupon:

American Petroleum Institute, Dept. G
50 W. 50th Street, New York 20, N. Y.

Please send me additional information on oil industry profits.

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With a new Little Creek discovery

Mississippi's Tuscaloosa bounces back

MISSISSIPPI'S once-popular Tuscaloosa formation, almost lost sight of in the swelling wave of exploration to Lower Cretaceous and deeper horizons is paying off again in the development of the new Little Creek field, on the Lincoln-Pike county line.

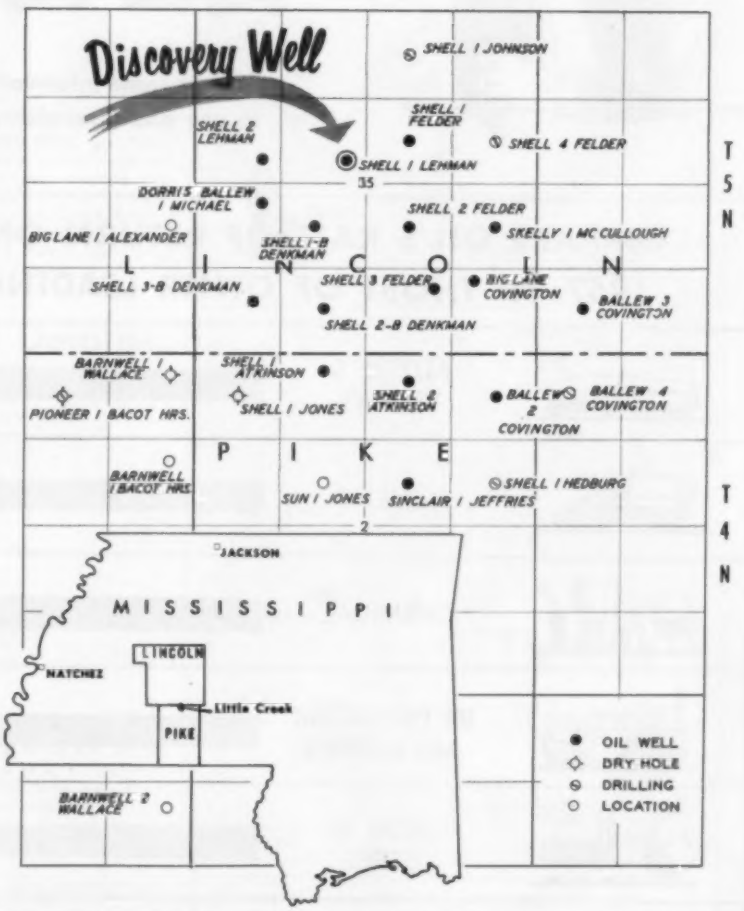
Little Creek field, discovered last January with production from the Upper Cretaceous-Lower Tuscaloosa sand, is turning out to be one of the state's richest finds in several years. As such it is renewing interest in the state's remaining Upper Cretaceous potentialities.

Scene of the state's most active field-development programs this year, Little Creek already has 17 producing oil wells. Productive area, only partly defined, now extends more than 1¼ miles, both from north to south and from east to west. Its pay zone is one of the thickest and most consistent in any Mississippi field.

Principal definition of the productive area is on the southwest side where three dry holes have been drilled, all within a close area. The only other definition is a dry hole (not shown on map) just completed by Dorris Ballew, Inc., et al, of Natchez, about 1¼ miles southeast of production, and another dry at the south edge of Sweetwater field, 1½ miles north.

Pay zones range in depth from about 10,700 ft. to 10,820 ft. Thickness of the pay so far has run from 20 ft. to as much as 60 ft. All wells have had an unusually high initial productivity. The smallest, Shell Oil Co. 3 Felder (see map), flowed 155 bbl. of oil per day through ⅛-in. choke. The highest productivity has been in a well just completed by Sinclair Oil & Gas Co. (1 Jeffries) on the south side of present production, which gaged more than 871 bbl. of oil per day through ¼-in. choke. Sand thickness in this well is 60 ft., the greatest amount taken in so far in any well in the field.

Most wells, however, have had flow rates above 500 bbl. per day through chokes ranging in size from 15/64-in to 8/64-in. Shell Oil Co.'s discovery well, 1 Lehman, completed with open hole at 10,765-90 ft., flowed initially at the rate of 588 bbl. per day through 15.5/64-in. choke. Under latest state allowable order, production is restricted to 300 bbl. per well.



NEW TUSCALOOSA FIND in Mississippi is in Little Creek field on the Lincoln-Pike county line. This field already has 17 producing wells.

Wells produce with exceptionally favorable gas-oil ratios, ranging from as little as 322 to 745 cu. ft. per barrel, and averaging 500 cu. ft. per barrel. Flowing pressures run 1,000 psi. through the tubing choke. Production is clean oil with gravity of 38° to 36.9°.

Pay zone is found 95 to 100 ft. below the top of the lower Tuscaloosa, subsea depth range of which in all the productive wells completed to date has been only 40 ft. Highest of these wells (Shell 2 Felder) topped the lower Tuscaloosa at minus 10,209 ft. The lowest (Ballew 3 Covington) got it at minus 10,249 ft. The average has been minus 10,227 ft.

Shell Oil Co. is the principal operator in the field with 11 of the oil-productive wells completed to date. Dorris Ballew, D. A. Biglane, and their associates come next with four wells. Skelly Oil Co. and Sinclair Oil & Gas Co. have one well each. Sun Oil Co. is a new entry in the development and is drilling its first well. Barnwell Production Co., and Pioneer

BY NEIL WILLIAMS
Associate Editor

Why you get more than a motor from Century Electric

Availability, quality, and know-how—all the things you want in motors. Here's why you get all this and *more* with Century Electric motors:

Availability—Ordering is simple because you can get any motor you need from 1/20 to 400 hp. When you have a wide variety of motors from which to choose, it's easier to get the one you need. Think how you save time when you get answers to all your motor needs in one place.

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CENTURY ELECTRIC COMPANY

St. Louis 3, Missouri *Offices and Stock Points in Principal Cities*

Century

FIELD DEVELOPMENT AT LITTLE CREEK

Company and well—	County	Comp. date	Total depth, ft.	Pay perf., ft.	Top L. Tusc., subsea ft.	IP, bbl./day	Choke size
Shell Oil Co.:							
1 Lehman	Lincoln	1-24-58	10,990	*10,765-90	.....	588	15/64
1 Atkinson	Pike	3-24-58	10,802	*10,776-802	10,211	440	12/64
1-B Denkman	Lincoln	4-1-58	11,009	10,750-86	10,235	544	13/64
2 Lehman	Lincoln	5-6-58	10,800	*10,772-800	10,231	504	13/64
1 Felder	Lincoln	5-6-58	10,754	*10,728-54	10,236	528	13/64
2 Felder	Lincoln	6-23-58	10,862	10,810-30	10,209	252	10/64
3 Felder	Lincoln	6-10-58	10,803	10,754-803	10,221	155	8/64
2-B Denkman	Lincoln	5-10-58	10,817	*10,786-817	10,229	235	9/64
2 Atkinson	Pike	6-10-58	11,109	10,773-824	10,229	372	11/64
3-B Denkman	Lincoln	6-13-58	10,885	10,766-815 10,821-30	10,225	432	13/64
1 D. D. Jones	Pike	6-28-58	11,022	.....	10,227	Dry	.....
1 Hedberg	Pike	7-14-58	10,882	10,772-96	.....	264	10/64
1 Michel, Jr.	Lincoln	4-3-58	10,868	10,785-815	10,218	538	16/64
2 Covington	Pike	6-7-58	10,825	10,742-76	10,243	624	15/64
Dorris Ballew, Inc., et al.:‡							
1 Dunaway†	Pike	7-3-58	11,036	.....	10,312	Dry	.....
1 Covington	Lincoln	4-26-58	10,833	10,747-86	10,236	653	15/64
3 Covington	Lincoln	6-22-58	10,805	10,722-54	10,249	464	13/64
Skelly Oil Co.:							
1 McCullough	Lincoln	5-14-58	10,862	10,754-98	10,231	728	16/64
Sinclair Oil & Gas Co.:							
1 Jeffries	Pike	7-7-58	10,843	10,746-80	10,210	871	16/64
Barnwell Prod. Co.:							
1 Wallace	Pike	6-10-58	11,005	.....	10,231	Dry	.....
Pioneer Oil & Gas Co.:							
1 Bacot Heirs	Pike	7-1-58	11,001	.....	.....	Dry	.....

*Open hole. †Wildcat 1¼ miles southeast of field (not on map). ‡Includes wells drilled for D. A. Biglane and others.

Oil & Gas Co. have drilled one dry hole each, as has Shell Oil Co., and the Dorris Ballew group.

Drilling at Little Creek has given work to eight contractors, including M. R. Young, Reading & Bates, Inc., Drilling & Exploration Co., Inc., Dixilyn Drilling Co., Rimrock-Tidelands, Inc., Sunnyland Contracting Co., Barnwell Production Co., and Dorris Ballew, Inc.

Development at Little Creek has given Pike County its first, and so far only production. Five of the field's wells are on the Pike County side. These include the field's second well, which extended initial production (in Lincoln County) ¾ mile south.

Pennsylvanian test drilling offshore

PENNSYLVANIAN exploration is centered in Lake Erie, Somerset County, Erie County, and in Fayette County.

New York State Natural Gas Co.'s offshore test in Lake Erie is running pipe at 1,635 ft. They found the Oriskany at 1,553-62 ft. with water.

Two wildcats are being drilled in the southern part of Somerset County on the Negro Mountain anticline. One is drilling at 202 ft.; the other at 346 ft.

Near the town of Northeast in Erie County, Benedum-Trees is starting a Medina test. In northern Fayette County, Snee & Eberle are drilling at 260 ft. at a wildcat test.

Southeast Marietta gets prolific well

SOUTHERN OKLAHOMA'S Southeast Marietta field picked up its second and most prolific producer last week.

Pasotex Petroleum Co. 1 J. C. Brannan, SW NE NW 30-7s-3e, Love County, flowed 7,230 M.c.f. of gas per day on 18/64-in. choke with 600 bbl. of condensate daily from perforations in the deep Oil Creek-Ordovician sand at 13,924-84 ft. Open flow potential is 30,500 M.c.f. of gas per day and 2,531 bbl. of condensate. The field is being developed on 320-acre locations.

The discovery well in this Marietta basin field was completed last year flowing 228 bbl. of condensate per day and 3,410 M.c.f. of gas per day on 14/64-in. choke from Oil Creek sand at 13,948-14,020 ft. Location of this prolific field is just west of a northward swing of the Red River in extreme southern Oklahoma.

20-well project set for Denver basin

PLANS to drill 20 wells in three different counties in the Denver-Julesburg basin have been announced by Falcon Seaboard Drilling Co.

The wells, many of them wildcats, will be on acreage farmed out by Pan American Petroleum Corp., Sinclair Oil & Gas Co., Skelly Oil Co., and Shell Oil Co.

The exploratory projects by Falcon Seaboard and others are to be in Logan and Weld counties, northeastern Colorado, and Banner, Cheyenne, Kimball, and Morrill counties, western Nebraska.

First of the ventures will be 1 Tappy, C NW SW 20-10n-56w, in Weld County, followed by 1 Motis-Sunderburg, C SW SE 6-9n-57w, and 1 Brauer, C SE NE 13-9n-57w, also in Weld County, and the 1 Heidemann, C NW NW 24-14n-56w, in Kimball County.

Two discoveries in Williston basin

TWO DISCOVERIES and new wildcat drilling were announced in the Williston basin last week. North Dakota strikes included Calvert Drilling Co. 1 Huff in Burke County, and Calvert's 1 Signalness in McKenzie County.

The Burke County discovery, 2½ miles southeast of Flaxton field, made 83 bbl. of oil and 30 bbl. of water daily from Madison-Mississippian perforations at 5,753-60 ft.

The McKenzie County discovery flowed 48 bbl. of oil per day and 25 bbl. of water from Madison at 9,386-94 and 9,414-28 ft. Location is 2 miles west of Blue Buttes field.

Amerada Petroleum Corp. will drill a remote wildcat about 45 miles southeast of Rocky Ridge field in Hettinger County. This Madison test will go to 8,000 ft. Location is in the southwestern part of the state.

Orderly arrangements of supplies that are tailored to each area's needs make shopping easy in National Supply Stores.

An oil show—open here every day!

Remember the industry's last International Oil Exposition at Tulsa . . . all the new equipment and product information? The same kind of show on a smaller scale is evident every day in the 130 National Supply Stores that serve oil men in the United States, Canada and Venezuela.

All the important elements are there. For your ease and convenience in shopping, you'll find equipment and supplies in orderly, attractive arrangements. Don't let the front counter stop you—you're welcome to browse throughout the store and the equipment yard.

The store also provides plenty of product information, usually displayed in a handy rack "library" on or near the counter. By checking this, and talking with the National sales people, you can quickly learn what's new in equipment . . . and the field news of the area, too.

The purpose of all National Store displays and the information we give is the same as the Oil Exposition—to help you drill your hole or operate your wells more efficiently. National Supply has 70 years of experience behind this purpose that can help you every day. Shop us soon.

This National Type A Rotary is in action on a rig in Arkansas. Put a National Rig behind your "A" Rotary and you have a combination that really means good drilling business!

New National Type A Rotaries are easy to install, operate and maintain!

The rotary design you've wanted is here—fully field-tested and as modern as any major drilling equipment available today. Look at these outstanding features of National Type A Rotaries:

Rectangular housing and guard—Simplifies installation in the derrick substructure and permits rig flooring to be flush-fitted to table top for cleaner, safer working areas.

Cartridge type pinion shaft assembly—Removable as a unit, this provides a single housing with a stronger and more rigid base. *Permanent bearing alignment* is assured, as well as easier maintenance, less adjustment and less vibration.

Unitized gear table assembly—Main and hold-down bearings are unitized with the table and this permits complete bearing adjustment before installation of the table assembly in the housing. The assembly is subsequently removable with all bearings intact, in working positions, *without disturbing adjustment.*

The rectangular housing and guard for National Type A Rotaries simplifies installation in the derrick substructure and permits rig flooring to be flush-fitted to table top for cleaner, safer working areas.

A National Type SA-175 Rotary ready for delivery with other derrick equipment from National's Torrance, California plant. The Type SA-175 has a 17½" table opening with 44" spacing. Other models are the LA-175—17½" opening with 53¼" spacing—and the A-205—20½" opening with 53¼" spacing.

Direct table locks—Locking pawls, to prevent table rotation either direction as desired, are applied to recesses or notches on the table perimeter. This totally eliminates excessive strain and shock loading on the pinion shaft, and the need for a lock ring on the shaft.

Accessibility and operation—Lock pawl handles, oil filler pipe, dip stick and lifting trunnions are all accessible at the top of the guard for easiest operation and maintenance. Rotary is easily sling-handled for convenient installation, inspection, maintenance and removal.

Oil bath lubrication throughout—Type A Rotaries have positively induced oil circulation for the pinion and gear, table bearing and pinion shaft bearings. No grease fittings are used, because grease lubrication is entirely eliminated.

In addition to these special features, National Type A Rotaries have the construction benefits long associated with all National Rotaries—perfectly matched spiral bevel gears, proven main bearings, improved pinion shaft assemblies and wide, non-skid tread tops. Add all the features and you have all the good reasons why you buy wisely when you choose a National Type A Rotary. New models are available in the popular 17½" and 20½" sizes. See them soon.

National Rigs and their ratings on the next page!

This National Type 55 Rig is rated at 700 input horsepower and is designed for drilling from 6,000 to 9,000 feet.

There's a National Rig for every drilling need!

You've heard for years—and if you've operated one, you know—how National Rigs have extra performance stamina built-in. Even under adverse conditions, they perform smoothly and last long.

Decades of field experience and performance record studies have produced this unchallenged conclusion: *National Rigs are designed to operate with maximum dependability at their horsepower and depth ratings.*

You can see by the ratings on this page that there's a National Rig to suit every possible drilling need.

In addition to the equipment leadership reputation they reflect, you're apt to find these performance ratings—like many of our customers do—definite assets in contract negotiations. If you have never owned or operated a National Rig, there are many good reasons for taking a second look. Ask the National representative in your area soon.

Type	Input Horsepower Rating	Depth Rating
8	120	1,000 to 2,000
12	200	1,500 to 3,000
20	300	2,000 to 4,000
32	400	3,000 to 5,500
45	550	4,500 to 7,500
55	700	6,000 to 9,000
80-B	1,000	8,000 to 12,000
110	1,375	11,000 to 16,000
130	1,625	13,000 to 20,000
1320	1,625	13,000 to 20,000
1625	2,500	16,000 to 25,000

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NATIONAL BLUE OIL FIELD MACHINERY AND EQUIPMENT

SPANG STEEL PIPE AND ELECTRICAL CONDUIT

Successful Wildcats

ALBERTA

Anglo-Pacific 10-13 Purple Springs, LSD 10, 13-11-14w4. Taber sands oil discovery. TD 3,021 ft.

Triad-Pan American 6-8 Grovedale, LSD 6, 8-68-8w6. Canadian gas discovery. TD 10,656 ft.

Supertest et al 16-7-48-5 Carnwood, LSD 16, 7-48-5w5. Cardium oil discovery. TD 6,489 ft.

Imperial Medallion 10-10-8-17 Chin Coulee, LSD 10, 10-8-17w4. Bow Island gas discovery. TD 3,391 ft.

CALIFORNIA

San Benito County: T. B. Hess 1 McDonald-Union, NE NE 24-16s-10e, 12 BOPD, 38°-gravity clean crude, Perfs. 516-26 ft., TD 530 ft. (New shallow pool discovery in Griswold Canyon near Vallecitos.

COLORADO

Baca County: Shell Oil Co. 1 Federal Land Bank, C SE NE 31-34s-44w. IP 1,770.5 M.c.f. of gas per day, 23.1 BOPD, 8 BW, 31, Marmaton 4,113-24 ft., 4,096-4,102 ft. Shut in gas well. TD 5,307 ft. Opens Prairie Dog field.

Logan County: Tom Vessels, Jr. and Strain Drilling Co. 1 Nicklas, C NW NW 30-9n-55w. IP 45 BOPD, 165 BW, "J" sand 5,660-68 ft. TD 5,744 ft. Opens Wildcat pool.

Moffat County: Skell 1 Dyer B, 35-12n-101w. IP 2,310 M.c.f. of gas per day, Lance 4,260-4,307 ft., Wasatch 2,470-2,520 ft., 2,540-46 ft., 2,612-16 ft. TD 6,112 ft. Opens Washakie basin field.

Union Oil Co. of California 1 Government-Wisdome, SW¼ 14-12n-95w. IP 3,700 M.c.f. of gas per day, Fort Union 4,124-34 ft. TD 4,991 ft. Opens Washakie basin field.

KANSAS

Barber County: Aylward Drilling Co. 1 Stumph-Smith "D", NW NW SW 8-32s-14w. IP 10,000 M.c.f. of gas per day, Massey 4,581-4,601 ft. TD 4,965 ft.

Barton County: V. D. Sidey 1 Schugart, NW NE NE 1-18s-15w. IP 60 BOPD, 36°, Arbuckle 3,540-44 ft. TD 3,620 ft. Opens Olmitz pool.

Ben Brack 1 Peterson, SW SW SW 7-19s-15w. IP 2,410 M.c.f. of gas per day, Reagan 3,598-3,607 ft. TD 3,631 ft. Opens Southwest Merten pool.

Butler County: Adair 1 Paulson NW NW NE 35-23s-3e. IP 35 BOPD, 38°, Mississippian 2,519-29 ft. TD 2,529 ft. Opens Paulson pool.

Stelbar Oil Corp. 1 Blood "B", SW SW NE 29-29s-4e. IP 3,424 BOPD, 37°, Miss. 2,735-45 ft. TD 3,031 ft. Opens Blood pool.

Ellis County: NCRA 1 D. K. North, SE NE NW 29-15s-20w. IP 19.54 BOPD, 10% water, 31°, Lansing 3,562-70 ft. TD 3,961 ft. New pay in North pool.

Okmar Oil Co. 1 Lang, SW SW NE 11-14s-17w. IP 2 BOPD, 93% water, 36°, Lansing 3,348-52 ft. TD 3,549 ft. Opens Southeast Toulon pool.

Graham County: Imperial Oil Co. of Kansas 1 Fabricius, NE NW 25-7s-23w. IP 2,769 BOPD, 40.1°, Lansing 3,637-38 ft., 3,648-50 ft. TD 3,890 ft. Opens Fabricius pool.

K&E Drilling Co. et al 1 Kobler "B", NE NE SE 27-8s-24w. IP 90 BOPD, 36°, Lansing 3,854-61 ft., 3841-44 ft. TD 3,920 ft. Opens Kobler pool.

Woodman-Iannitti & Brown & Fortier 1 Faulkner, NW NW NW 22-10s-22w. IP 38 BOPD, 30% water, 36°, Lansing 3,776-80 ft., 3,760-64 ft., 3,767-69 ft. TD 3,932 ft. Opens Faul pool.

SOUTH LOUISIANA

St. Charles Parish: The Texas Co. 54 State Lease 347, Lake Salvador. IP 91 BOPD, 9/64-in., 34.5°, GOR 1,225 cu. ft. per barrel, TP 400 psi., perfs. 9,676-92 ft. TD 10,750 ft. (New pay in Lake Salvador field.)

St. Mary Parish: C. G. Glasscock, et al 1 State Lease 2682, East Cote Blanche Bay. IP 3,240 M.c.f. daily, GLR 34.46 M.c.f. per barrel, 65°, ⅞-in., TP 4,400 psi., perfs. 13,714-18 ft. TD 14,203 ft. (New field.)

British-American Oil Producing Co. 1 Whitney, 44-16s-13e. Shut-in gas well, no gage, perfs. 14,790-98 ft. and 14,726-66 ft. TD 15,439 ft. (Second well and new pay in Ramos field.)

Terrebonne Parish: Shell Oil Co. 2-E Continental Land & Fur Co., 19-17s-14e. IP 41 BOPD and 4,400 M.c.f. daily, 11/64-in., 51.6°, TP 5,845 psi., perfs. 13,143-53 ft. TD 17,517 ft.

MICHIGAN

Ottawa County: Devine & Lang 1 Kok NW SE SW 29-5n-14w, Zeeland Township, 1 mile north Overisel Salina gas field. IPF 75 bbl. Elev. 604 ft. Detroit River 1,802, Salina 2,284, A-2 zone 2,618, A-1 zone 2,792, Niagaran 3,026, TD 3,052, PB 2,815. Pays 2,777-2,884, 22°-gravity black oil. (New oil pool.)

NEBRASKA

Banner County: Roh Oil Co. 1 Van Pelt, C NE NW 24-18n-58w. IP 79 BOPD, 15-20 BW, 6,204-16 ft. TD 6,276 ft. Opens Roh field.

Morrill County: Ohio Oil Co. 2 Lane, W½ W½ NW 17-17n-49w. IP 125 BOPD, "J" sand 4,583-95 ft. TD 4,661 ft.

OKLAHOMA

Beaver County: Shell Oil Co. 1-33 State, C NW SE 33-3n-26eCM. IP 75 BOPD, 3 BWPD, 38°, Morrow 7,670-94, 7,753-63 ft. TD 8,000 ft. Opens Clear Lake field.

Pan American Petroleum Corp. 1 Oyler Gas Unit "B," NW NW SE 22-5n-23eCM. IP 2,790 M.c.f. of gas per day, 19 BW, Council Grove 3,322-24 ft. TD 6,800 ft. New pay in South Forgan field.

Beckham County: Canadian Oil & Gas Co. 1 Blain, NE NE NE 16-7n-26w. IP 8 BOPD, 35 BWPD, 37°, dolomite 1,983-91 ft. TD 2,576 ft.

Coal County: Atmar Drilling Co. 2 La Fevers, SE SW NE 3-2n-8e. IP 8,500 M.c.f. of gas per day, Union Valley-Cromwell 3,100-15 ft. TD 4,816 ft. New pay discovery.

Garvin County: Nelson & Spain Oil Co. 1 Tolbert, C NE NE 34-3n-1w. IP 240 BOPD, 42° gravity, first Bromide 4,868-74 ft. TD 5,005 ft.

Harper County: Hamilton Bros., Ltd. 1-1 R. L. Dies, C SW NE 1-27n-21w. IP 240 BOPD, 44.3° gravity, Big Lime-Oswego 5,434-44 ft. TD 7,447 ft. New pay at North Lovedale.

Shell Oil Co. 1-7 F. W. Madsen, NE¼ 7-26n-25w. IP 22,800 M.c.f. of gas per day, 125 BOPD, 57°, Morrow 6,715-32 ft. TD 7,000 ft. New pay in East Stockholm.

Kiowa County: Curtis Pryer 1 State, SW NE SW NW 21-6n-16w. IP 15 BOPD, 32°, Hunton 440-501 ft. TD 501 ft.

Love County: Sinclair Oil & Gas Co. 1 A. L. Tucker, C NE NW SW 32-6s-3e. IP 11,700 M.c.f. of gas per day, 97.3 BOPD, 55°, basal Oil Creek 10,620-10,722 ft. TD 10,722 ft.

Marshall County: Shell 1 Little, SE NW 15-8s-5e. IP 15 BOPD, 38.7°, Des Moines 2,804-68 ft. TD 5,298 ft.

Osage County: Bert Wheeler and SDX 1 Osage, SE NE SE 32-23n-7e. IP 32 BOPD, 8 BSW, Wilcox 2,846-51 ft. TD 3,014 ft.

L. B. Smith 1 Thompson, SE SE NW 15-24n-4e. IP 75 BOPD, 5 BSW, 42°, Miss. chat 3,510-14 ft. TD 4,093 ft.

Pawnee County: H. J. Griffith et al 1 Diamond, SW SW SE 8-23n-3e. IP 25 BOPD, 60 BWPD, 38.2°, Skinner-Red Fork 3,527-38 ft. TD 3,538 ft.

Texas County: Republic Natural Gas Co. 9 Cities Service, C SE SW 5-4n-13eCM. IP 8,436 M.c.f. of gas per day, Morrow 6,677-89 ft. TD ?. New pay in Guymon-Hugoton field.

Woods County: Gulf Oil Corp. 1 Gosson, C SE NW 33-24n-13w. IP 2,900 M.c.f. of gas per day, 60°, 6,332-50 ft. TD 6,891 ft.

Woodward County: Calvert 1 Young, C NE NE 17-24n-18w. IP 6,884 M.c.f. of gas per day, Chester 6,669-6,737 ft. TD 6,950 ft.

SASKATCHEWAN

Canadian Devonian 13-13 Kreiger, LSD 13, 13-4-3w2. Mississippian oil discovery. TD 4,371 ft.

Imperial 2-27-731 Frys, LSD 2, 27-7-31w1. Mission Canyon oil discovery. TD 3,365 ft.

British American-Union 10-12 Shinfield, LSD 10, 12-4-1w2. Mission Canyon oil discovery. TD 4,010 ft.

NORTH TEXAS

Baylor County: Bobby M. Burns 1 Melear Unit, Sec. 220, T&NO Sur., A-1369, 1 mile northwest Rendham-Mississippian field. IP 111 BOPD, 42° gravity, GOR 560, Mississippian 5,460-65 ft. TD 5,493 ft.

SOUTHWEST TEXAS

Webb County: Weaver & Sharp 1 Dan Adami Estate, Sur. 4, A-2083 (20 miles northwest of Freer). IP 32.56 BOPD, 22°, Mirando sand 1,129-36 ft. (open hole). TD 1,136 ft. (New field—Que Sera.)

Zapata County: Breuer & Curran Oil Co. 1 J. C. Martin, Trustee, Share 7, Jaral Pasture, Jose V. Borrego Grant (15 miles northeast of San Ygnacio). Absolute open-flow 5,000 M.c.f. daily, 10 BC per M.M.c.f., shut-in TP 1,760 psi., perfs. 4,646-54 ft. (Wilcox). TD 6,891 ft. (New gas-condensate reservoir in La Perla area.)

Gulf Oil Corp. 1 De Trevino, Lot 10, Sec. 66, J. M. Montemayor Sur., A-409. Absolute open-flow potential 13,000 M.c.f. daily, GLR 198,148 cu. ft. per barrel, 52.8°, shut-in TP 1,953 psi., perfs. 5,298-5,315 ft. (Queen City). TD 9,995 ft. (New pay in Escobas field.)

Zavala County: W. J. Steeger 1 Ware, Sec. 311, George Buckhart Sur., A-74. IPP 95.94 BOPD, 33.7°, perfs. 3,007-22 ft. (San Miguel). TD 3,512 ft. (New field discovery—Torch.)

WEST CENTRAL TEXAS

Haskell County: Robert C. Humphrey 3-A Elmer Wedeking, I. P. Wallace Sur. 57, 4 miles north of Stamford. IP 172 BOPD, 18/64-in., 41° gravity, GOR 260, TP 260 psi., Cisco sand 2,604 ft. TD 2,609 ft.

Bedford's Back in U. S. Oil

. . . after short assignment with Pan Am International. As head of production, he hopes to find ways to lower costs.

C. F. BEDFORD'S sally into the Middle East oil business was one of the shortest on record.

It lasted just 6 weeks. But that was long enough for Pan American Petroleum Corp.'s new vice president for production to learn an important lesson in his new job. The lesson: Drillers in the U. S. must find new and better ways to produce oil if they intend to compete with the flush wells of the Middle East.

Bedford is a red-haired 6-ft., 6-in. 220-pounder who has known the life and lingo of the oil business ever since he can remember.

To him, oil is a challenge, not a gamble.

"Yes, there's a risk involved, but I don't think of it in terms of a gamble," he says. "I play it on facts. You utilize good judgment, and you get results."

And that's what Bedford plans to do as the new chief of Pan Am's domestic operations that produced an average of 307,000 bbl. daily of crude and natural gas liquids in the U. S. and Canada last year.

Double take . . . Last April Bedford held the job of general superintendent of production for Pan Am in Tulsa.

It was then he got the call to take over his short-lived foreign assignment, with headquarters in New York. Elevated to vice president-production and director of Pan Am's new subsidiary, Pan American International Oil Co., Bedford packed off to New York for a few days and then flew to the Eastern Hemisphere to look over his company's operations.

For a month he toured Pan Am's holdings in Libya and the Iranian Persian Gulf, several points in Europe, and finally London. It was at London that he got the word.

He was moving back to Tulsa—this time as vice president-production for the parent company to replace Frank Lindeman, Jr., who had resigned.

Bedford, a strapping man not given ordinarily to sentiment, says frankly he wishes he could have given the foreign job a real whirl.

"But, on the other hand," he says, with an impersonal philosophic touch, "you had responsibilities at home and had to put on another hat."

His enthusiasm regained, he turns quickly to the immediate task ahead.

"You can see what a terrific job we have in this country to compete with operations in the Middle East. If we are going to compete, we must improve our operations and cut our costs. In the Middle East they drill a minimum number of wells to produce a maximum amount of oil.

"That is a challenge to our conservation groups. We've got to find new ways to drill slim, cheap exploratory holes. We need more automation."

The way up . . . Bedford was born on New Year's Day, 1908, in a small town near Oklahoma City, was reared in Oklahoma City, and went west when 17 years old to work in the California oil fields as a roughneck.

It was no accident he turned to oil. His father, the late E. G. Bedford, was an independent Oklahoma producer.

In California, young Bedford enrolled at U.C.L.A. for a year, played center and guard on the football team, and then switched to the University of California, to complete his B.S. degree in petroleum engineering. The

Personals

J. N. Perkins, Amarillo, Tex., production division superintendent for Phillips Petroleum Co., has been transferred to Midland, Tex., as superintendent of the western division there. He succeeds **M. R. Hayes,** recently transferred to international department as Canadian manager. **W. M. Schul,** Denver division superintendent, has been named superintendent of central division in Oklahoma City. Schul replaces **M. L. Atkinson,** who has been transferred to the international department as company representative in Jordan. **F. W. Shelton,** Wichita division superintendent, has been appointed assistant to the manager of the central production area. Phillips will close its Amarillo, Wichita, and Denver production division offices July 31.

Ed Wilson, consulting geologist, has been elected president of the Indiana-Kentucky Geological Society. Other officers are **Ralph Thomas,** Texas Gas Transmission Corp., vice president; and **Conrad Shaw,** V. R. Gallagher, secretary-treasurer. On the executive committee are **John Van Fossen,** Kewanee Oil Co.; **Tom McCann,** Shell Oil Co.; and **Tom Dawson,** Indiana Geological Survey.

Donald L. Sedgwick, general manager of Peoples Natural Gas division of Northern Natural Gas Co., has been elected a vice president of Northern Natural. Sedgwick was director of marketing for Northern before becoming general manager of Peoples earlier this year.

next year, 1932, he earned his master's degree.

Bedford found that two college degrees could guarantee no job in 1932's depression. Reversing the Okie trend to California, he headed east looking for work and finally found it—as a roustabout with Stanolind Oil & Gas Co. (now Pan Am) in the fields around Wewoka, Okla.

Within 3 months he had proved himself. He was moved to Tulsa in January 1933, as an engineer. Then began a succession of production jobs that moved him steadily toward the top: District engineer, Beaumont, 1935-36; assistant division engineer, division engineer, and assistant division production superintendent, Houston, 1936-47; chief production engineer, Tulsa, 1947-49; division production superintendent, Fort Worth, 1949-56; general superintendent, producing department, Tulsa, 1956-58.

When Standard of Indiana, parent of Pan American, decided to return to the Middle East after an absence of 29 years, it was production expert Bedford the company tapped for the job of getting a return on its big investment.

And then came the change in signals because of the big vacancy back in the home office.

Personal life . . . Bedford has a wife and three daughters, ages, 19, 17, and 12.

The initials "C. F." stand for Charles Francis, and he's both "Charley" and "Red" to his friends.

He keeps his big robust frame in trim by golfing, hunting, and fishing. And he's not a bad bass in the Episcopal Church choir.

Two brothers are Gulf Oil Corp. executives. Henry Bedford is manager of exploration at Denver, and Edwin N. Bedford is manager of Western Gulf's land department at Los Angeles.

John W. Lee, area supervisor in Clay City, Ill., for Sohio Pipe Line Co., has been appointed superintendent of the eastern division, operating trunk pipeline facilities from Illinois to Ohio. He will headquarter in Mooreville, Ind. **James M. Goodwin,** safety engineer, will move from St. Louis to Clay City to succeed Lee as area supervisor. **Frank W. Ridgway,** corrosion engineer, has been promoted to senior division engineer in the Tri-State division headquarters, Grayville, Ill. **Thomas A. Hendricks,** formerly senior division engineer in Grayville, has been named safety engineer in St. Louis. Lee joined Sohio in 1944. Goodwin has been with the company since 1953. Ridgway joined the company in 1955, Hendricks in 1952.

Peter A. MacQueen, exploitation engineer with Shell Oil Co. in Midland, Tex., has been transferred to Houston in the same capacity with Shell Development Co.

Charles Robert Black, junior petroleum engineer, has been transferred to Monument, N. M., from Abilene, Tex., by The Texas Co.

C. H. McClure, Denver, division exploration superintendent for Sinclair Oil & Gas Co. since 1954, will become assistant division manager in Tulsa August 1. He succeeds **R. M. Kobdish,** who was transferred to Houston as assistant division manager earlier this year. McClure joined Shell in 1950.

E. C. Wilson, manager of the land department for LaGloria Oil & Gas Co., has been named a vice president and assistant to **John F. Lynch,** president of LaGloria and senior vice president of its parent company, Texas Eastern Transmission Corp. LaGloria plans to move its headquarters to Houston from Corpus Christi, Tex., next month.

James E. Holdeman, district geologist for Pubco Petroleum Corp., has been transferred to Albuquerque from Aztec, N. M. Also moving from Aztec to Albuquerque are **Richard C. Jacobs,** junior geologist, and **K. Neil Taylor,** junior geologist-scout. **Norman E. Maxwell, Jr.,** production superintendent, and **Maurice L. Seelinger,** engineer, will continue to headquarter in Aztec.

Ralph S. Jones, recent graduate of the University of Tulsa, has joined Amerada Petroleum Corp. as production engineer in Tioga, N. D.

Alvin H. Kisner has been transferred from Bakersfield, Calif., to the Riverdale, Calif., production department of McCulloch Oil Exploration Co. of California.

Robert R. Risher, Jr., group head in Esso Research & Engineering Co.'s products research division, has been promoted to head of the new business and mechanical section in the division. A graduate of Lehigh University and Newark College of Engineering, Risher joined Esso Research in 1948.

Personals

CARSON

D. B. Carson has moved up from pilot plants manager for Universal Oil Products Co. to manager of the engineering department. He will supervise all department activities including project engineering, process engineering, and engineering services. In other appointments, **L. O. Stine,** assistant pilot plants manager, succeeds Carson as manager; **Karl T. Hartwig,** project coordinator, becomes head of the project section; and **J. H. Vavra,** chief estimator, becomes head of the engineering services section. Carson has been with UOP since 1941. He was coordinating engineer before being named pilot plants manager in 1955.

Ernest A. Kiesler has been appointed supervisor of operations of Geophysical Service, Inc., in the California, Washington, Oregon, and Nevada area. He will headquarter in Bakersfield, Calif.

Warren O. Sparks, formerly with Carter Oil Co., has joined National Cooperative Refinery Association as production engineer in Great Bend, Kans.

Dr. Charles W. Seelbach has been named head of the chemicals section in exploratory and product research at Esso Research & Engineering Co.'s Linden, N. J., laboratories. Seelbach was formerly on rotational assignment as assistant section head in the chemicals unit at Esso Research Laboratories, Baton Rouge, La.

Julian Herring, petroleum engineer for Magnolia Petroleum Co. has been transferred to Abilene, Tex., from Duncan, Okla.

E. T. (Tom) Murphy has resigned from the geological department of Midstates Oil Corp. to join McGoldrick Oil Co. in Shreveport, La., as geologist.

George V. Dunn, Sinclair Oil & Gas Co.'s assistant district production superintendent in Nowata, Okla., has been promoted to district production superintendent in Carmi, Ill. He succeeds **Chester R. Richards,** recently transferred to Lindsay, Okla., as district production superintendent.

Personals

William D. Mounger, former petroleum engineer with Humble Oil & Refining Co., has joined the Deposit Guaranty Bank & Trust Co., Jackson, Miss., as petroleum engineer in the newly organized petroleum department of the bank. Mounger will work with **W. M. Vaughey,** who was recently elected vice president and head of the bank's petroleum department.

Dale Worth, formerly Continental Oil Co. Denver division engineer, has joined Hamilton Dome Oil Co., Ltd., as production manager in the company's new Denver production office.

Oliver J. Kangas has been named operations manager of Esso Research & Engineering Co.'s products research division. Kangas joined Esso Research in 1938.

Herbert J. G. Frost has been appointed assistant general manager of Sun Chemical Corp.'s chemical group.

Kenneth E. Carter, Durango, Colo., consultant, has been elected president of Four Corners Geological Society. **Robert M. Byington,** Pan American Petroleum Corp., has been named first vice president. Other officers are **James E. Holdeman,** Pubco Petroleum Corp., second vice president; **Donald L. Barrs,** Shell Oil Co., secretary; and **Howard G. Alexander,** Pure Oil Co., treasurer.

Fu-Yui Chan and **Martin J. Volandt** have joined Atlantic Refining Co.'s research and development department as junior development engineers.

Brian Morrow, section head in Esso Research & Engineering Co.'s planning engineering division, has been named assistant director in planning engineering. He succeeds **Richard O. Wright,** who has been transferred to design engineering as an assistant director. Wright succeeds **William Goryl,** now on special assignment.

B. J. Bullard, drilling foreman for Shell Oil Co., has been promoted to Houston area drilling engineer.

A. L. Hardy, assistant superintendent for Magnolia Petroleum Co. at San Antonio, has been transferred to Corpus Christi.

George W. Crafts, Jr., formerly with American Can Co., and **James R. Colvert,** formerly with Armour Research Foundation, have joined the Whiting, Ind., research laboratories of Standard Oil Co. (Ind.). Crafts will work with pilot-plant studies of petroleum processes. Colvert will do research on improvement of motor oils.

Ray Lewis, formerly geologist with **Homer Rutherford,** Mount Vernon, Ill., independent operator, has joined **John J. Oslager,** drilling contractor and independent operator in Mount Vernon.

Charles Cohen has been appointed a research associate by Esso Research & Engineering Co. Cohen joined Esso in 1930.

J. E. Oaks, foreman for Texas Pipe Line Co., has been promoted to area supervisor and transferred to Sherman, Tex., from Seminole, Okla.

J. F. McCanne, chief process engineer in charge of the lube-oil process-control section at Magnolia Petroleum Co.'s Beaumont, Tex., refinery, has been promoted to senior technologist there. **A. B. Hiser,** assistant chief, will succeed McCanne. McCanne joined Magnolia in 1938 after graduation from Texas A. & M. College. Hiser, a Kansas State College graduate, joined the company in 1948.

H. Don Binney, drilling superintendent for Hi-Tower Drilling Co., Ltd., Calgary, has been named vice president in charge of operations. Binney has been with the company and its predecessors since 1939. He began as a roughneck and later was driller, pusher, and assistant superintendent. In 1954 he became drilling superintendent and a director of the company.

F. M. Cole, Honolulu Oil Corp.'s vice president in charge of petroleum engineering, has been promoted to vice president in charge of the new western division, which includes the western United States and Alaska. He will also be in charge of development and production in the new northern Rocky Mountain division. **P. E. McGovney** is vice president in charge of exploration in the northern Rocky Mountains. Cole has been with Honolulu since 1936. He had been vice president in charge of petroleum engineering since 1951.

F. Walker Johnson, assistant manager of exploration for Creole Petroleum Corp. in Caracas, has been elected vice president and a director of Jersey Production Research Co. He will headquarter in Tulsa. **Dr. Parke A. Dickey,** manager of the geological division for Jersey Production Research, has been given an 18-month

JOHNSON

DICKEY

assignment with Creole. He will be in charge of the company's western division exploration section in Maracaibo, Venezuela. **Dr. Robert W. Landes,** manager of exploration research for Imperial Oil, Ltd., in Calgary, will move to Tulsa as manager of Jersey Research's geological division during Dickey's assignment.

R. Paul Henry, financial vice president of Sunray Mid-Continent Oil Co., has also been named treasurer of the company. He succeeds the late Louis W. Bennett. Henry was named treasurer of D-X Sunray Oil Co., Sunray's refining and marketing subsidiary, in 1954 and financial vice president of that company in 1955. He was elected financial vice president and a director of the parent company earlier this year.

J. N. Mendenhall, general manager of domestic crude-oil production for Atlantic Refining Co., has retired. A graduate of Baylor University and Yale Law School, Mendenhall joined Atlantic in 1919. He had been general manager of domestic crude-oil production since 1952. Mendenhall is succeeded by **Edgar Kraus,** assistant general manager of the department (OGJ, Mar. 10, p. 263).

Adolph C. Shotts, formerly with Continental Oil Co., has joined Petroleum Chemicals, Inc., in Lake Charles, La., as a research chemist.

H. T. Capelle, division production geologist for Shell Oil Co. in Wichita Falls, Tex., has been transferred to Midland, Tex., as division exploitation engineer there. **D. D. Bowling,** Houston production geologist, has moved to Wichita Falls as North Texas division production geologist, succeeding Capelle.

MAXWELL

H. J. Maxwell, assistant general manager, producing department, for Standard Oil Co. of California, Western Operations, Inc., has been elected president of the California Natural Gasoline Association. He succeeds **E. W. Walker,** Western Gulf Oil Co. Other officers are **K. C. Vaughan,** Union Oil Co., vice president and chairman of the advisory committee; and **E. R. Millett, Jr.,** secretary-treasurer.

F. W. Hertel, Tidewater Oil Co.; **G. W. Gaulding,** Western Gulf Oil Co.; and **George Mintier,** Bankline Oil Co., have been appointed to fill unexpired terms on the CNGA board.

Elected to 2-year terms as directors were **Leonard Andrews,** Petrolane Gas Service, Inc.; **M. L. Arnold,** Richfield Oil Corp.; **P. E. Beckman,** Pacific Gas & Electric Co.; **Ira C. Bechtold,** consultant; **F. W. Borden,** Sunray Mid-Continent Oil Co.; **R. O. Boykin,** Monterey Oil Co.; **A. H. Bradford,** West Coast Refining Co.; **F. E. Bradley,** Chanslor-Western Oil & Development Co.; and **C. L. Case,** Continental Oil Co.

Also, **L. V. Cassaday,** Lomita Gasoline Co.; **W. F. Crane,** Getty Oil Co.; **J. T. Doyle,** Shell Oil Co.; **H. L. Eggleston,** analyst; **E. Vernon Frost,** Frost Engineering Service Co.; **Fred L. Hartley,** Union Oil Co.; **C. B. Heartwell,** Standard Oil Co. of California; **C. L. Hutchings,** Tidewater Oil Co.; **M. W. Kibre,** General Petroleum Corp.; and **William A. Kirk, Jr.,** Pacific Gasoline Co.

Others are **R. E. Loeck,** California Research Corp.; **George C. McLaren,** retired; **H. W. Parmelee,** consultant; **George Sowards,** Ohio Oil Co.; **H. D. Spiers,** Superior Oil Co.; **J. B. Taylor,** Signal Oil & Gas Co.; **R. S. Tulin,** retired; **C. R. Usher,** Algas Fuel Service, Inc.; **E. W. Walker,** Western Gulf Oil Co.; and **Lloyd Woodruff,** The Texas Co.

J. N. Biron has been appointed senior vice president for International Drilling Co. and transferred to London from Rome. **B. G. Frazier** has been appointed vice president, engineering, for the company. **O. D. Blankenship** has been named assistant, operations, to **Monty R. Garrison,** managing director of International. Frazier, Blankenship, Garrison, and **Wallace March,** joint managing director with Garrison, headquarter in Rome. International currently has 16 rigs operating in Europe, Africa, and the Middle East. The company is also opening a U. S. office in Houston. **Jack Ennen,** formerly with Gulf Oil Corp., has been named representative there.

W. D. Price, district engineer with Humble Pipe Line Co., in Longview, Tex., has been promoted to senior engineer in Midland, Tex.

Dr. Eric Stern has been appointed research chemist with M. W. Kellogg Co., New York. He will work in exploratory research. Stern was formerly with The Texas Co. in Beacon, N. Y.

Dr. William C. Hayes, Jr., has been named assistant state geologist by the Missouri Geological Survey. He succeeds **Dr. G. A. Mullenburg,** who has retired after 10 years with the survey. Hayes was a consulting geologist before joining the Missouri Survey in 1956 as economic geologist.

G. Ray Fritsche, formerly a student at Marietta College, Marietta, Ohio, has joined Continental Oil Co. in Linch, Wyo., as engineer trainee.

Charles D. Slaven, formerly a student at Oklahoma State University, has joined Shell Oil Co. in Martinez, Calif., as technologist.

Joseph A. Keeling has been assigned to Seismograph Service Corp.'s Tulsa office for management training, working with the company's foreign subsidiaries. **Charles C. Perry, Jr.,** has been temporarily named manager of Colombian operations for the company during the vacation of **Jack Nash.** Keeling joined Seismograph Service in 1945. In 1951 he was named supervisor in Venezuela for the company. He left SSC to join Phillips Petroleum Co. in 1953. Keeling was exploration manager for Phillips in Venezuela before rejoining Seismograph Service earlier this year. Perry, formerly assigned to Colombia for the company, and before that to Mexico and Venezuela, is now working toward a degree in geology at the University of Oklahoma.

William W. Mueller has joined Atlantic Refining Co. as junior process engineer in the lubricating section.

Nathan V. Hendricks, head of industrial hygiene activities in Esso Research & Engineering Co.'s medical research division, has been appointed a senior engineering associate. Hendricks joined Standard Oil Co. (N. J.) in 1947. He has been with Esso Research since 1951.

Personals

Lloyd Armstrong, recently named general manager of Tidewater Oil Co.'s central division, has been named a vice president of the company. Armstrong was assistant general manager of the division in Houston before moving to Tulsa as central division manager a few months ago.

Jay C. Karp has joined Gulf Research & Development Co. as a research engineer in the production engineering division. Karp is a graduate of Marietta College and the University of Oklahoma.

John D. Edwards has joined Arkansas Fuel Oil Corp., Shreveport, as a junior engineer. Edwards received a master's degree from Oklahoma University last month.

Jim Wilkson, tool pusher with Falcon Seaboard Drilling Co., has been transferred to Casper, Wyo., from Gillette, Wyo.

M. G. Whitcomb and **W. E. Stevens** have been promoted to senior chemical engineers in the technical division at Humble Oil & Refining Co.'s Baytown, Tex., refinery.

DEATHS

J. W. (Bill) Straub, 82, Rouseville, Pa., oil operator and contract driller in Kansas in the early part of the century, died July 11 at his home.

August G. Ott, 96, oldest retired employe of Esso Standard Oil Co., died July 7. Ott's retirement lasted 35 years, 2 months. He was a foreman at Esso's Baltimore refinery when he retired in 1923 after 23 years of service with the company.

J. L. Johnston, 71, Cape Vincent, N. Y., a director of Phillips Petroleum Co., died July 14 after a long illness. Johnston was elected to the Phillips board in 1919. He had been on the board longer than any other director.

Bryant F. Kenney, 49, director and former executive of Standard-Vacuum Oil Co., died July 14 in New York. Kenney was with Esso Standard Oil Co. before joining Stanvac in 1951.

Needed: lower gasoline yields

BY JOHN C. CASPER
Economics Editor

GASOLINE STOCKS are below last year's but still are too high. Comparison with last season is misleading because inventories were too high at this time last year. In fact, gasoline stocks have been excessive for the past two summers.

The chart shows stock trends for the past 3½ years. The stock pattern for 1955 was near normal with the decline continuing through September. Note that the inventory lines for 1956 and 1957 were well above the 1955 line at the end of March. Also, gasoline stocks for these years tended to level out earlier in the season. There was very little drop during June 1956, and stocks increased in September of both years.

Also, the chart shows that refiners did a good job this year in working off gasoline stocks in April and May. This was accomplished through sharp reductions in refinery runs, particularly in April. The average for that month was 7,189,000 bbl. daily, the lowest since April 1955.

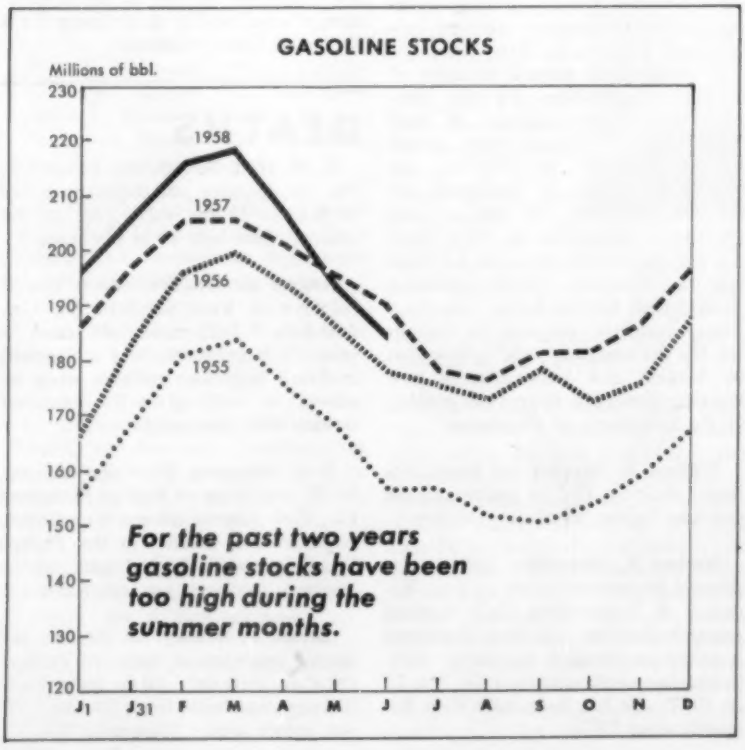
Runs jumped to 7,690,000 bbl. daily for the first week of June but dropped back gradually for the next 4 weeks. However, gasoline production has not decreased with the reduction in runs.

Total gasoline production at refineries averaged 3,895,000 bbl. daily for the week ended June 6, the week of high runs, and 3,897,000 bbl. daily for the week of July 4. The change was due to increased yields of gasoline from crude.

Gasoline production represented 50.7% of crude input for the week of June 6 but climbed to 52.2% for the week of July 4. The combination of high refinery runs and the present high yield of gasoline could stop the normal stock decline before inventories are down to required levels.

A quick look at the highlights . . .

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,435,825	UP	55,885	DOWN	356,850
Crude stocks	255,161,000	DOWN	2,959,000	DOWN	23,864,000
Completions	880	DOWN	194	DOWN	131
Refinery runs	7,607,000	UP	146,000	DOWN	365,000
Gasoline stocks	182,169,000	DOWN	1,111,000	UP	196,000
Kerosine stocks	25,040,000	UP	586,000	DOWN	4,213,000
Distillate stocks	109,507,000	UP	2,936,000	DOWN	16,057,000
Residual stocks	66,155,000	UP	1,383,000	UP	19,135,000
Four-product stocks	382,871,000	UP	3,794,000	DOWN	939,000
Total imports	1,409,000	DOWN	270,100	DOWN	232,500

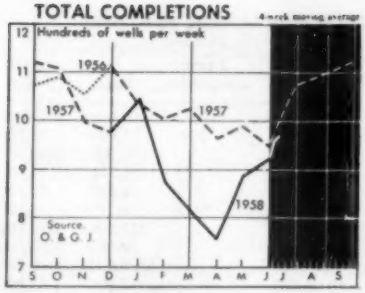


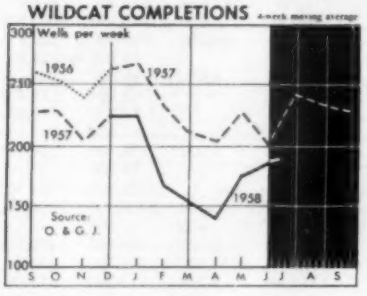
Prices Rise, But Not Enough

Gasoline prices are firmer in the Mid-Continent and on the Gulf Coast, but both prices are still too low. Gulf Coast regular gasoline is only 0.1 cent higher than in the summer of 1948.

If refiners produce so much gasoline that part of it has to be dumped on the open market, the current price strength will evaporate.

No. 2 distillate is up about 0.25 cent on the Gulf Coast to 8.375 cents a gallon. Even after the increase, the price is the lowest since the summer of 1955 and is 0.675 cent below the low price for 1948. Group 3 No. 2 fuel is quoted at 8.25 cents, also the lowest price since the summer of 1955. It will take several more increases to bring distillate prices up to normal.





Active Rotary Rigs*

	7-14-58	7-7-58	7-15-57
Alabama	6	6	4
Arkansas	11	11	37
Arizona	....	....	....
California	78	77	99
Colorado	50	52	49
Florida	1	1	2
Georgia	....	....	....
Idaho	....	....	....
Illinois	56	46	57
Indiana	9	7	5
Iowa	3	3	2
Kansas	120	127	167
Kentucky	7	11	17
Louisiana	304	302	437
North	44	39	56
South	214	219	276
Offshore	46	44	105
Maryland	....	....	....
Michigan	8	10	10
Missouri	2	1	1
Montana	19	18	25
Mississippi	34	39	33
Nebraska	20	25	35
Nevada	....	....	1
New Mexico	110	122	174
New York	2	2	....
North Dakota	32	34	23
Ohio	....	....	....
Oklahoma	187	204	275
Oregon	1	1	1
Pennsylvania	9	9	17
South Dakota	....	....	....
Texas	634	655	942
Gulf Coast	126	127	199
Offshore	2	5	3
West	260	255	362
North	205	222	321
East	41	46	57
Tennessee	....	....	....
Utah	37	37	50
Washington	....	....	1
West Virginia	6	6	4
Wyoming	56	59	80
Virginia	....	....	....
Total U. S.	1,802	1,865	2,548
Western Canada	142	134	209
Eastern Canada	2	3	2
Grand total	1,946	2,002	2,759

*Hughes Tool Co.

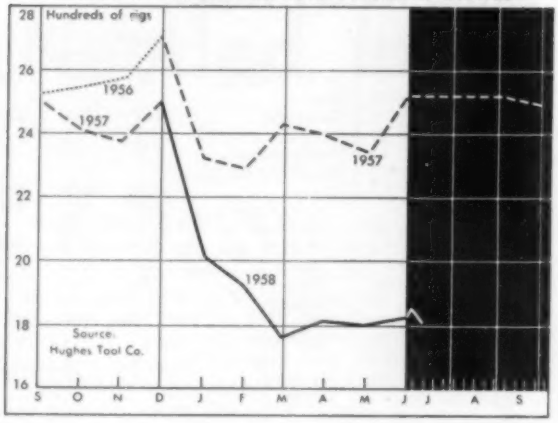
WEEKLY WELL COMPLETIONS . . . WEEK ENDED JULY 12, 1958

	Total wells							Cumulative		Total wildcats					Cumulative	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1958	1957	Total	Crude	Cond.	Gas	Dry	1958	1957
Alabama	0	0	0	0	0	0	0	41	52	0	0	0	0	0	16	14
Arkansas	18	9	0	1	8	0	56,915	354	546	5	0	0	1	4	91	99
California	37	15	0	2	20	0	144,603	907	1,128	19	3	0	0	16	198	279
Colorado	10	4	0	0	6	0	54,359	392	449	6	1	0	0	5	215	302
Illinois	44	18	0	0	26	0	121,285	1,067	1,287	9	0	0	0	9	215	320
Indiana	14	6	0	0	8	0	19,963	372	322	5	0	0	0	5	140	66
Kansas	75	30	0	5	37	3	265,903	1,954	2,214	19	1	0	0	18	410	440
Kentucky	35	14	0	4	16	1	58,675	547	727	3	2	0	0	1	62	146
Louisiana	60	31	6	5	18	0	421,526	1,759	2,010	6	0	1	0	5	251	362
North	24	9	0	5	10	0	86,154	616	687	3	0	0	0	3	87	91
South	25	16	3	0	6	0	219,489	905	933	3	0	1	0	2	148	223
Offshore	11	6	3	0	2	0	115,883	238	390	0	0	0	0	0	16	48
Michigan	12	1	0	1	5	5	26,302	209	208	5	1	0	0	4	74	86
Mississippi	9	3	0	0	6	0	82,061	207	201	3	0	0	0	3	102	102
Montana	2	1	0	0	1	0	10,870	186	196	0	0	0	0	0	81	67
Nebraska	12	6	0	0	6	0	70,570	362	432	5	2	0	0	3	173	242
New Mexico	38	19	0	8	11	0	177,592	1,017	1,097	9	0	0	0	9	134	147
West	22	9	0	8	5	0	99,858	482	418	5	0	0	0	5	59	52
East	16	10	0	0	6	0	77,734	535	679	4	0	0	0	4	75	95
New York	11	5	0	0	1	5	17,440	305	241	1	0	0	0	1	32	2
North Dakota	6	3	0	0	3	0	31,752	222	142	1	0	0	0	1	72	56
Ohio	33	10	0	11	5	7	77,153	545	560	0	0	0	0	0	5	5
Oklahoma	140	74	8	11	33	14	483,065	3,481	3,280	16	3	2	2	9	483	375
Pennsylvania	0	0	0	0	0	0	0	310	353	0	0	0	0	0	9	35
Texas	284	145	15	23	100	1	1,228,528	9,490	11,460	65	7	0	2	56	1,959	2,885
District 1	18	7	2	1	8	0	61,640	535	661	9	1	0	0	8	218	224
District 2	10	2	2	0	6	0	67,302	405	381	3	0	0	0	3	106	146
District 3	24	4	2	2	16	0	180,571	699	965	9	0	0	1	8	149	278
District 4	14	6	1	0	7	0	77,768	646	753	2	0	0	0	2	187	263
East	20	9	2	0	9	0	95,990	639	660	5	0	0	0	5	183	204
District 7-B	46	19	1	6	20	0	127,971	1,256	1,473	15	3	0	0	12	354	545
West	71	58	1	1	11	0	335,267	2,778	3,266	8	2	0	0	6	389	486
District 9	56	33	0	2	20	1	164,205	1,866	2,560	11	1	0	0	10	317	682
District 10	25	7	4	11	3	0	117,814	666	741	3	0	0	1	2	56	57
Utah	3	1	0	0	2	0	14,637	214	102	2	0	0	0	2	40	58
West Virginia	21	2	0	18	1	0	58,414	367	330	1	0	0	0	1	11	15
Wyoming	13	3	0	2	8	0	82,838	371	428	3	0	0	1	2	105	141
Miscellaneous*	3	0	0	0	3	0	24,411	55	54	3	0	0	0	3	47	37
Total U. S.	880	400	29	91	324	36	3,528,862	24,734	27,819	186	20	3	6	157	4,925	6,281
Total prev. wk.	1,074	514	20	106	390	44	4,118,181	.....	.....	216	29	3	6	178	.....	.....
Cum. 1958	24,734	12,175	613	1,888	9,439	619	103,694,704	.....	.....	4,925	480	80	154	4,211	.....	.....
Western Canada	38	30	0	2	6	0	173,457	1,260	576	5	0	0	0	5	392	434

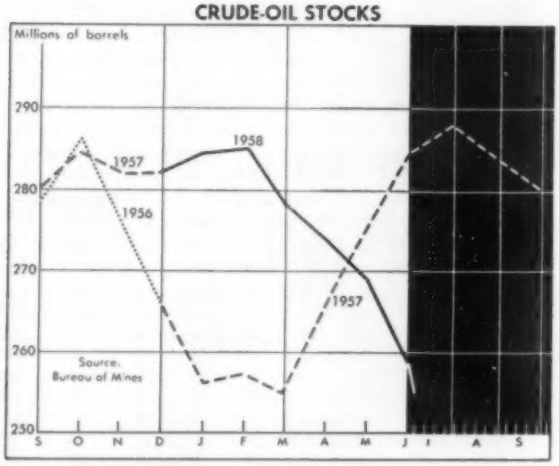
*Incl. Alaska and Tennessee.

PRODUCTION

ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS



CRUDE-OIL STOCKS BY STATES OF ORIGIN*
(Thousands of barrels)

	7-5-58	6-28-58	7-6-57
Pennsylvania	2,885	2,887	2,851
Other Appalachian	1,343	1,358	1,501
Illinois, Indiana, and Michigan	10,709	11,334	10,652
Nebraska, and North Dakota	2,162	2,069	2,627
Kansas	9,894	10,345	10,743
Oklahoma	17,176	17,024	21,530
Arkansas	2,241	2,323	2,536
Louisiana	15,453	16,030	18,831
North	2,830	2,867	2,893
South	12,623	13,163	15,938
Mississippi, Alabama, and Florida	2,053	2,050	3,447
New Mexico	6,404	6,529	8,632
Texas	105,888	106,623	128,472
East Texas	7,173	7,385	11,450
West Texas	49,248	50,292	60,800
Texas Gulf	21,733	21,189	24,646
Other Texas	27,734	27,757	31,576
Wyoming	14,930	15,863	17,446
Other Rocky Mountain	8,294	8,248	5,923
California	39,462	39,438	28,084
Foreign	†16,267	15,972	15,750
Total	**255,161**	258,120	279,025

*Bureau of Mines. †Includes 5,560,000 bbl. in California.

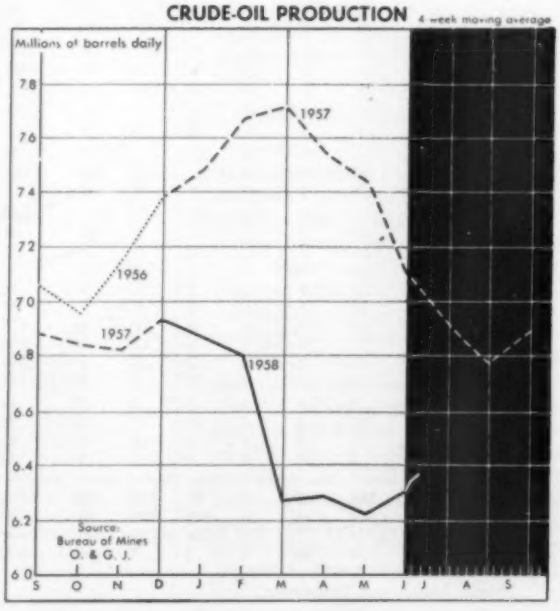
DAILY AVERAGE PRODUCTION FOR WEEK

	July 12, 1958			
	Crude oil	Lease condensate	Total	July 5 total
Alabama	17,620	.....	17,620	17,700
Arkansas	74,790	210	75,000	75,100
California	850,800	.....	850,800	849,200
Colorado	132,300	.....	132,300	132,000
Eastern	46,900	.....	46,900	47,200
Florida	1,275	.....	1,275	1,200
Illinois	225,500	.....	225,500	231,600
Indiana	31,100	.....	31,100	31,000
Kansas	†295,980	.....	†295,980	†313,290
Kentucky	42,800	.....	42,800	43,300
Louisiana	732,000	82,300	814,300	811,675
North	106,000	2,250	108,250	109,100
South	626,000	80,050	706,050	702,575
Michigan	24,900	.....	24,900	24,600
Mississippi	94,225	3,975	98,200	98,200
Montana	78,200	.....	78,200	78,400
Nebraska	54,200	.....	54,200	54,000
Nevada	100	.....	100	100
New Mexico	271,200	5,200	276,400	266,575
North Dakota	39,000	.....	39,000	38,100
Oklahoma	†525,500	.....	†525,500	†534,400
Texas	2,343,000	63,100	2,406,100	2,346,950
Dist. 1	43,000	400	43,400	44,475
Dist. 2	96,000	8,600	104,600	102,025
Dist. 3	327,000	31,000	358,000	352,850
Dist. 4	175,000	8,200	183,200	178,050
Dist. 5	26,000	300	26,300	26,075
Dist. 6	100,000	6,200	106,200	102,775
East Texas field	129,000	.....	129,000	125,150
Dist. 7-B	125,000	100	125,100	123,825
Dist. 7-C	122,000	4,150	126,150	204,000
Dist. 8	912,000	1,900	913,900	873,175
Dist. 9	185,000	1,600	186,600	189,600
Dist. 10	103,000	650	103,650	104,950
Utah	89,000	.....	89,000	90,000
Wyoming	310,500	.....	310,500	295,200
Others	‡150	.....	‡150	‡150
Total U. S.	6,281,040	154,785	**6,435,825**	6,379,940
Change from previous week, up			**55,885**	
Canada	†404,300	.....	†404,300	†400,100

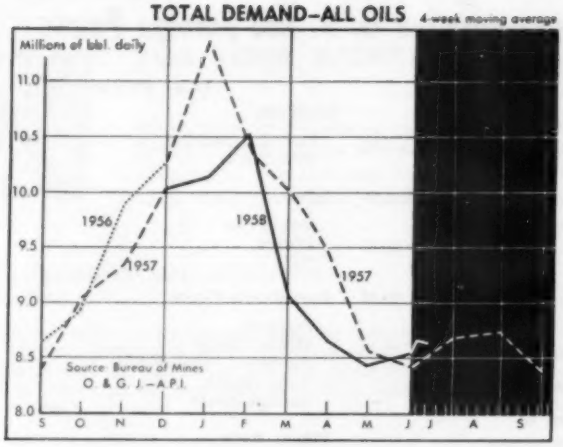
Total U. S. production, January 1-July 12 ..... 1,245,593,800 bbl.
Same period last year (crude plus cond.) ..... *1,438,783,400 bbl.

*Includes 27,295,625 bbl. condensate. †Week ended previous Monday. ‡South Dakota.

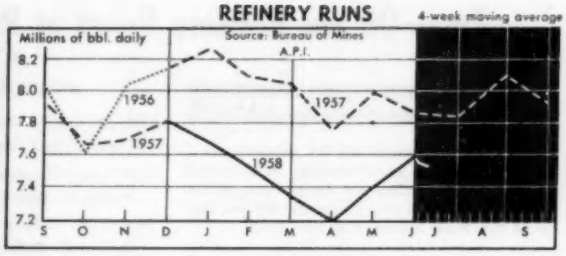
CRUDE-OIL PRODUCTION
4 week moving average



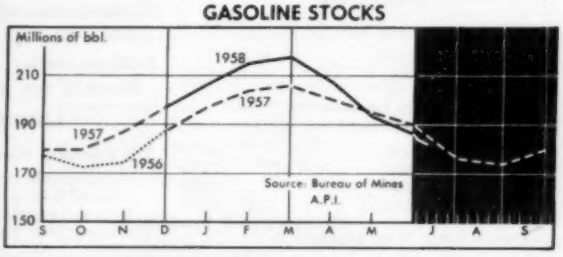
TOTAL DEMAND—ALL OILS 4-week moving average



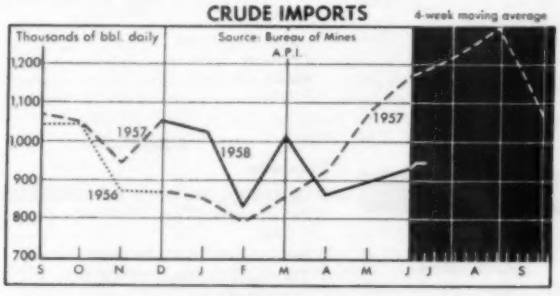
REFINERY RUNS 4-week moving average



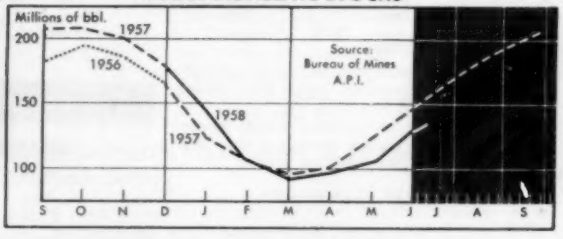
GASOLINE STOCKS



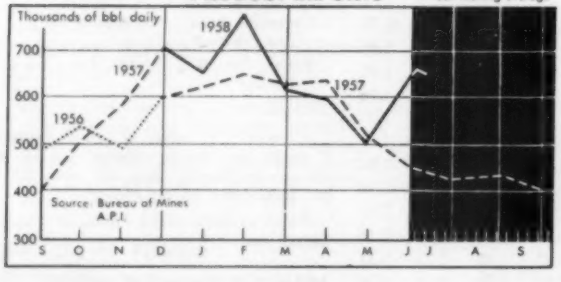
CRUDE IMPORTS 4-week moving average



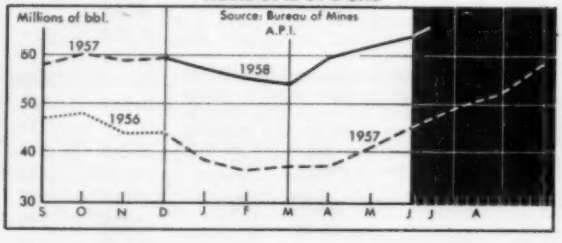
MIDDLE-DISTILLATE STOCKS



PRODUCT IMPORTS 4-week moving average



RESIDUAL STOCKS



API REFINERY REPORT—JULY 11, 1958
(Thousands of barrels)

District—	Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.	Stocks‡: Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, July 1957: Daily avg. runs	Daily average production: Gaso.*	Kero.	Dist.	Resid.
East Coast ...	953	481.0	9.9	273.4	159.6	42,778	9,368	35,438	13,165	1,235	483.3	30.8	322.6	229.2
Appalachian:														
Dist. 1	97	42.9	1.6	23.3	4.7	4,550	540	2,492	602	102	45.3	2.5	22.3	4.8
Dist. 2	99	59.7	0.4	16.8	9.4	2,633	482	1,060	378	48	26.8	2.4	6.8	7.1
Ind., Ill., Ky. ...	1,414	737.0	65.7	282.8	155.4	33,968	5,637	18,579	5,508	1,271	662.9	53.8	254.2	139.9
Minn., Wis., Dak.	109	52.6	4.7	26.9	11.0	7,049	1,317	5,882	620	104	48.7	5.6	30.2	8.2
Okla., Kans., Mo.	763	413.7	13.3	184.6	26.6	16,114	1,421	10,698	1,022	728	405.0	11.8	160.3	28.1
Inland Texas ..	256	198.3	9.7	37.8	17.9	6,470	329	1,570	2,091	278	212.3	8.5	49.6	20.6
Tex. Gulf Coast	1,792	878.0	74.0	426.3	213.4	22,407	2,810	11,235	7,482	1,854	904.1	77.6	471.7	241.6
La. Gulf Coast	591	356.3	26.6	159.1	33.7	8,917	1,623	4,899	1,609	668	361.1	45.5	169.0	45.3
N. La. and Ark	107	37.1	4.1	26.9	7.1	4,633	841	1,784	158	97	34.7	5.6	22.4	6.7
Rocky Mountain:														
New Mex. ..	19	8.4	1.1	4.6	2.9	611	19	132	66	26	13.7	0.1	6.2	2.3
Other Rky. Mt.	287	134.9	2.6	60.6	33.1	6,251	258	2,894	975	285	134.1	2.1	61.4	34.6
West Coast ...	1,120	572.7	1.7	163.6	317.2	25,788	395	12,844	32,479	1,156	500.5	2.7	172.9	321.2
July 11, 1958	7,607	3,972.6	215.4	1,686.7	992.0	182,169	25,040	109,507	66,155	7,852	3,832.5	249.0	1,749.6	1,089.6
July 4, 1958	7,461	3,897.4	261.6	1,589.7	960.4	183,280	24,454	106,571	64,772	.....	.....	.....	.....	.....
July 12, 1957	7,972	3,837.3	250.3	1,857.1	1,105.6	181,973	29,253	125,564	47,020	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipe lines.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (89 octane)	12.00-12.25
★ Premium (99 octane)	15.00-15.25
Gulf Coast (cargoes for coastwise or export movements):	
★ Regular (90 octane)	10.75
★ Regular (92 octane)	11.00
★ Premium (97 octane)	12.00
Premium (98 octane)	12.125-12.25
California (rack) (Los Angeles):	
Regular (88 octane)	11.3-11.5
Premium (96 octane)	12.8-13.0
Premium (98 octane)	13.3-13.5
Caribbean area (cargoes):	
★ Regular (87 octane)	10.25-10.375
★ Premium (97 octane)	12.00

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grade 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16 lb. Prices for grades below 16 lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.25-9.50
Diesel oil (58 d.i. and above)	8.875-9.125
Distillate No. 1	8.875-9.125
Distillate No. 2	8.25-8.50
Gulf Coast (cargoes):	
★ Kerosine 41-43	8.625
★ Distillate No. 2	8.375
New York Harbor (barges):	
Kerosine 41-43	9.35
Distillate No. 2	8.85
Diesel fuel, 48-52 d.i.	9.45
Caribbean area (cargoes):	
★ Distillate No. 2	8.25

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude-scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max 1% S)	$1.25-1.30
Gulf Coast (cargoes):	
Bunker C fuel	$2.20-2.25
New York Harbor (barges):	
Bunker C fuel	$2.57
Caribbean (cargoes):	
Bunker C	$2.25
California (rack):	
Bunker C fuel, Los Angeles	$2.45

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	23.0
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.5
Pennsylvania Grade:	
145-155 vis. at 210, bright stock, 8 color, 25 p.t.	22
200 vis. neutral (180° at 100°), 25 p.t.	21

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.§	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo. (sour)
14-14.9	$2.36	....	....	....	....
15-15.9	2.41	....	....	....	$1.81
16-16.9	2.46	....	....	....	1.86
17-17.9	2.51	....	....	....	1.91
18-18.9	2.57	....	....	....	1.96
19-19.9	2.62	....	....	....	2.01
20-20.9	2.68	$2.75	....	$2.62	2.06
21-21.9	2.73	2.77	....	2.64	2.11
22-22.9	2.78	2.79	....	2.66	2.16
23-23.9	2.84	2.81	$3.44	2.68	2.21
24-24.9	2.89	2.83	3.46	2.70	2.26
25-25.9	2.95	2.85	3.48	2.72	2.31
26-26.9	3.00	2.87	3.50	2.74	2.36
27-27.9	3.06	2.89	3.52	2.76	2.49
28-28.9	3.11	2.91	3.54	2.78	2.54
29-29.9	3.16	2.93	3.56	2.80	2.59
30-30.9	3.22	2.95	....	2.82	2.63
31-31.9	3.27	2.97	....	2.84	2.67
32-32.9	3.33	2.99	....	2.86	2.71
33-33.9	3.38	3.01	....	2.88	2.75
34-34.9	3.44	3.03	....	2.90	2.79
35-35.9	....	3.05	....	2.92	2.83
36-36.9	....	3.07	....	2.94	2.87
37-37.9	....	3.09	....	2.96	2.89
38-38.9	....	3.11	....	2.98	2.91
39-39.9	....	3.13	....	3.00	2.93
40 and up	....	3.15	....	3.02	2.95

*Includes Oklahoma (sweet), part of Kansas, North Dakota, W. Texas (sweet). Some Oklahoma available for 15 cents less starting 3-17-58 and other at 10 cents less on 4-1-58. †Low cold test crude. ‡Sour. §Some postings 3-11 cents lower.

Effective dates of broad changes: California, 6-22-58; east of California, January 3-10, 1957; Pennsylvania Grade 6-18-58.

FLAT PRICES

Louisiana:	
Bienville (distillate)	$3.05
Ville Platte	3.45
Texas:	
East Texas	3.25
Conroe	3.53
Van	3.08
Pennsylvania Grade:	
Bradford	3.90
Middle District	3.72
Southwest Pennsylvania	3.43
West Virginia	3.25
Buckeye Grade	3.25
Illinois Basin	3.00
Canada:	
Leduc-Woodbend	2.67
Redwater (Alta.)	2.56
Smiley (Sask.)	2.33
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.9°, Tucupido	3.75
San Joaquin, 41°-41.9°, Puerto La Cruz	3.34
Oficina, 35°-35.9°, Puerto La Cruz	3.05
Tia Juana medium, 26°-26.9°, Amuay*	2.55
Quiriquire, 16.0°-16.4°, Caripito	2.30
Lagunillas heavy, flat, Amuay or Las Piedras*	2.25
Bachaquero, flat, 15°-16°, Las Piedras*	2.08

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$2.12
Iranian, 34.0°-34.9°, Bandar Masur	2.04
Iranian, 34.0°-34.9°, Abadan	1.99
Iraq, 35.0°-35.9°, Fao	1.98
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.85
Qatar, 41.0-41.9°, Umm Said	2.23
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.49
Iraq, 36.0°-36.9°, Tripoli, Banias	2.49
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°	2.75

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Iso-Flow Furnace 19,000,000 BTU/hr., Inlet Temp., 447° F., 200 PSIG, Outlet Temp. 670° F., 135 PSIG.: Charge Gas/Oil 106,294 lbs./hr.

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8'0" x 75'0"	25 PSI Monel lined	22 Trays
6'0" x 30'0"	50 PSI	9 Trays
5'0" x 58'0"	50 PSI	26 Trays
3'0" x 45'0"	260 PSI Packed	
3'0" x 32'0"	40 PSI	8 Stainless Trays
3'0" x 23'6"	600 PSI Packed	
2'6" x 77'6"	275 PSI	32 Stainless Trays
2'6" x 43'6"	180 PSI	24 Trays
2'6" x 30'0"	270 PSI Packed	

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STEEL TUBE 170, 880, 1080 Sq. Ft.
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1550	75 PSI	125 HP Motor
680	65 PSI	40 HP Motor

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ACCOUNTANT, BBA, 33, 6 years experience production companies, all phases, tax background. Box 31 J 284, The Oil and Gas Journal, 4041 Marlton Ave., L. A. 8, Calif.

GEOLOGIST, Canadian, 28, married, 6 years Canadian experience, wellsite and subsurface, with major, desires foreign position. Box K-784, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST—diversified experience West Texas-New Mexico desires retainer from active independent. Resume and interviews on request. Box K-781, The Oil and Gas Journal, Tulsa, Oklahoma.

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PETROLEUM and NATURAL GAS ENGINEER—Registered, seven years production, drilling, appraisal, secondary, Gulf Coast and Mid-Continent. One employer. References extremely good. Desire responsible position. Prefer Gulf Coast. Box K-782, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, MS. Former major company division geologist with considerable subsurface experience. Have administrative and executive ability. Desires foreign or Alaska contract. Box K-771, The Oil and Gas Journal, Tulsa, Oklahoma.

CONTROLLER. Texas CPA, attorney. Ten years public accounting with National Firm. Contact clients, supervise staffmen four to ten concurrent audits. Heavy petroleum, also wholesaling, stock brokerage, estates, trusts experience. Stockholder, SEC reports; taxes; operations analysis; acquisitions and mergers; accounting research. Directed audit staff training; prepared training case studies and staff textbook on petroleum accounting. Taught college accounting. Familiar with business literature and sources of information; can summarize in meaningful reports. Box K-785, The Oil and Gas Journal, Tulsa, Oklahoma.

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LEASE AND DRILLING BLOCKS

PRINCIPALS with unlimited funds seek any-sized oil-gas production. Give details; strict confidence. Box K-774, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE, 287 acre Oil lease with six producing wells all with time clocks, room for several more wells, a lot of activity in this area. Lindgren Agency, 628 Main St., Osawatomie, Kansas.

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NEWHALL — Los Angeles County, Oil Land for lease or sale. Owner, 403 N. Lucerne Blvd., Los Angeles. HO 5-4931.

640 ACRE Government Oil Lease, North West corner Colorado. Near production. Sabin, Box 535, Pacific Palisades, Calif. GL 4-4031.

GOVERNMENT Oil and Gas Lease. Adjacent to drilled test well. Need help to further test. Excellent logs, pipe line to Los Angeles. Could be new field. Joseph Kals, 7330½ Kester Ave., Van Nuys, Calif. ST 5-8461.

UP TO ¼ INTEREST in drilling well Okmulgee County, Oklahoma, for sale reasonable. Well starting this week. 650 ft. Senora Sand. 2 offsets. Box K-763, The Oil and Gas Journal, Tulsa, Oklahoma.

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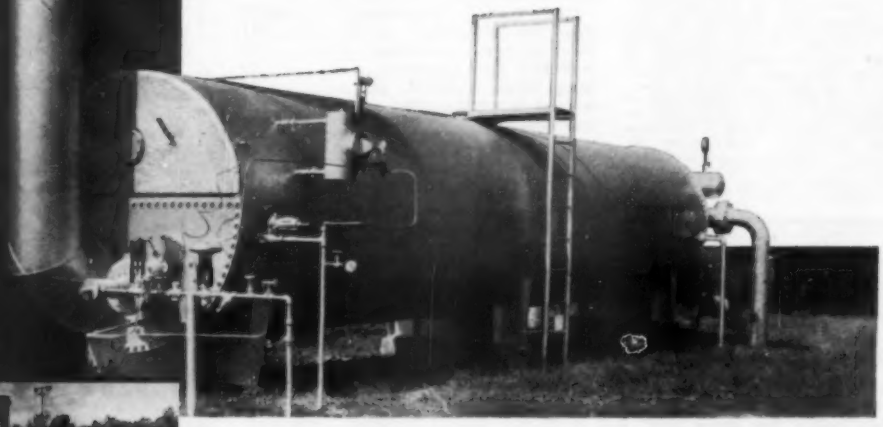

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Inlet pressure, heater	690 psi
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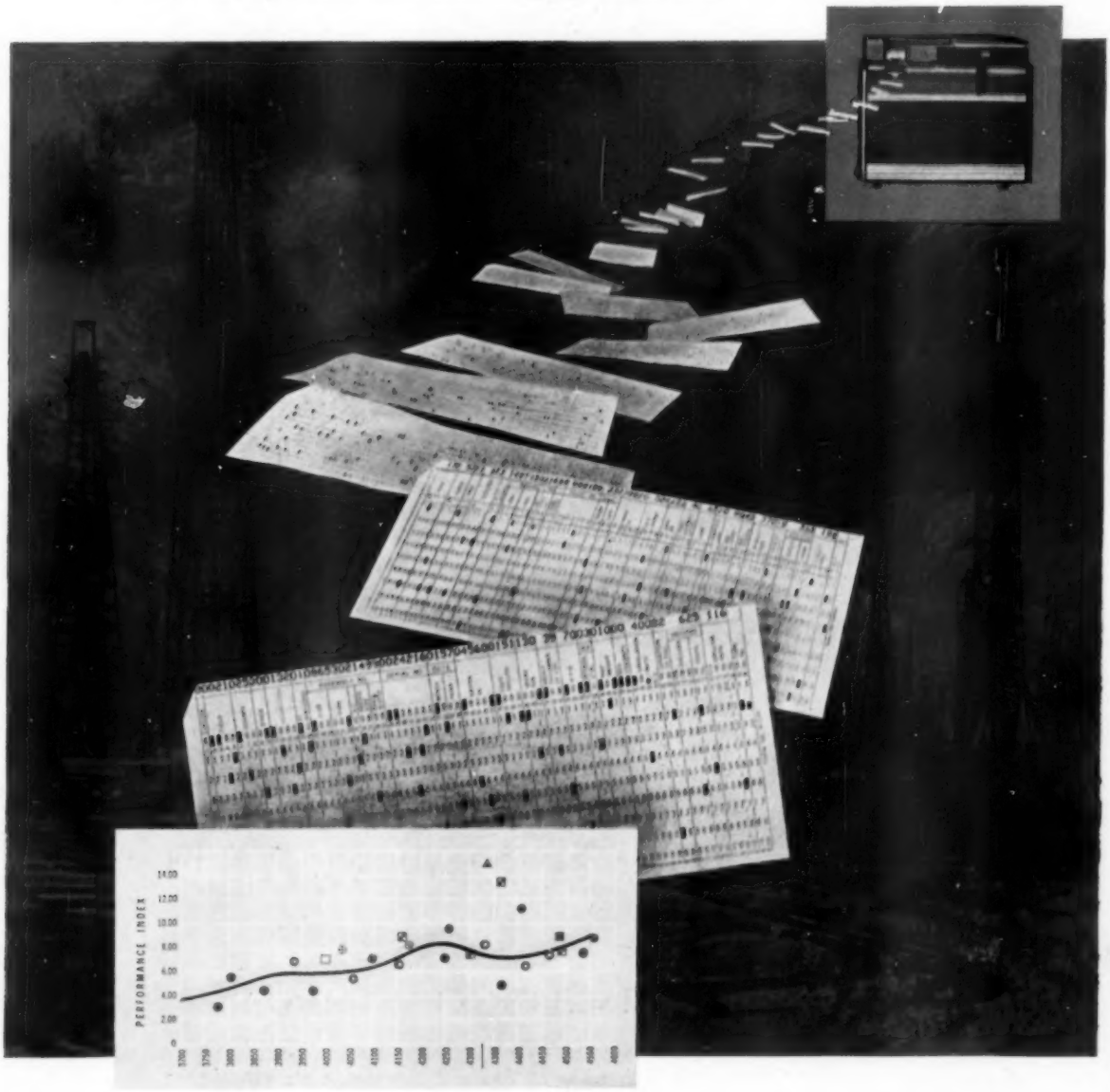
A SERVICE DIVISION OF THE DOW CHEMICAL COMPANY

FROM HUNDREDS OF THOUSANDS OF BIT RUNS...



...facts that are helping Hughes make better rock bits!

It takes performance facts — verified again and again — to make better rock bits.

That's why we are tabulating, *electronically*, a half million bit runs per year. These runs are from wells throughout the United States and Canada.

Performance patterns, revealed by the *electronic analysis* of the tabulated facts, assist Hughes' experienced rock bit engineers in their evaluation of bit designs and materials. Coordinated with a study of "dulls" — sent into the Research Laboratory from the various fields — these facts help give you rock bits that deliver superior performance.

HUGHES TOOL COMPANY